AD-A234 794

NASA Contractor Report 187506

ICASE

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through DECEMBER 31, 1990

NASA

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INTRODUCTION

The Institute for Computer Applications in Science and Engineering (ICASE) is operated at the Langley Research Center of NASA by the Universities Space Research Association (USRA) under a contract with the Center. USRA is a non-profit consortium of major U. S. colleges and universities.

The Institute conducts unclassified basic research in applied mathematics, numerical analysis, and computer science in order to extend and improve problem solving capabilities in science and engineering, particularly in aeronautics and space.

ICASE has a small permanent staff. Research is conducted primarily by visiting scientists from universities and industry who have resident appointments for limited periods of time, and by consultants. Members of NASA's research staff also may be resident at ICASE for limited periods.

The major categories of the current ICASE research program are:

- Numerical methods, with particular emphasis on the development and analysis of basic numerical algorithms;

- Control and parameter identification problems, with emphasis on effective numerical methods;

- Computational problems in engineering and the physical sciences, particularly fluid dynamics, acoustics, structural analysis, and chemistry;

- Computer systems and software, especially vector and parallel computers, microcomputers, and data management.

ICASE reports are considered to be primarily preprints of manuscripts that have been submitted to appropriate research journals or which are to appear in conference proceedings. In the next section, a complete listing of ICASE reports for the calendar years 1975 through December 1989 are given. The final section contains journal and conference proceedings references for older reports.

ICASE Reports - 1990

Seddougui, S. O. and Andrew P. Bassom: *On the instability of Görtler vortices to nonlinear travelling waves.* ICASE Report No. 90-1, January 31, 1990, 44 pages. To appear in IMA Journal of Applied Mathematics.

Ou, Yuh-Roung, and S. S. Sritharan: *Upper semicontinuous global attractors for viscous flow.* ICASE Report No. 90-2, January 2, 1990, 28 pages. Submitted to Journal of Dynamics and Differential Equations.

Mavriplis, D. J.: *Euler and Navier-Stokes computations for two-dimensional geometries using unstructured meshes.* ICASE Report No. 90-3, January 2, 1990, 30 pages. Canadian Aeronautics and Space Journal, Vol. 36, No. 2, pp. 62-71, June 1990.

Nicol, David M.. and Joel H Saltz: *An analysis of scatter decomposition.* ICASE Report No. 90-4, January 3, 1990, 20 pages. IEEE Trans. on Computers, Vol. 39, No. 11, 1990, pp. 1337-1345.

Speziale, Charles G., Sutanu Sarkar, and Thomas B. Gatski: *Modeling the pressure-strain correlation of turbulence – An invariant dynamical systems approach.* ICASE Report No. 90-5, January 2, 1990, 52 pages. Journal of Fluid Mechanics, in press.

Iqbal, M. Ashraf: *Efficient algorithms for dilated mappings of binary trees.* ICASE Report No. 90-6, January 9, 1990, 41 pages. Submitted to IEEE Trans. Parallel & Distributed Computing.

Koelbel, Charles, Piyush Mehrotra, and John Van Rosendale: *Supporting shared data structures on distributed memory architectures.* ICASE Report No. 90-7, January 9, 1990, 19 pages. Proceedings of the 2nd SIGPLAN Symposium on Principles and Practice of Parallel Programming, March 1990, pp. 177-186.

Jones, Mark T. and Merrell L. Patrick: *Factoring symmetric indefinite matrices on high-performance architectures.* ICASE Report No. 90-8, January 9, 1990, 15 pages. Submitted to SIAM Journal for Matrix Analysis and Application.

Singer, Bart A., Thomas A. Zang, and Gordon Erlebacher: *TS – Dean interactions in curved channel flow.* ICASE Report No. 90-9, January 18, 1990, 44 pages. Submitted to Journal of Fluid Mechanics.

Durlofsky, Louis J., Stanley Osher, and Bjorn Engquist: *Triangle based TVD schemes for hyperbolic conservation laws.* ICASE Report No. 90-10, January 19, 1990, 30 pages. To in Journal of Computational Physics under the new title *Triangle based adaptive stencils for the solution of hyperbolic conservation laws.*

Perthame, Benoit, and Eitan Tadmor: *A kinetic equation with kinetic entropy functions for scalar conservation laws.* ICASE Report No. 90-11, January 19, 1990, 20 pages. Communications in Mathematical Physics, in press.

Morris, K. A.:*Robustness of controllers designed using Galerkin type approximations.* <u>ICASE</u> <u>Report No. 90-12</u>, January 24, 1990, 20 pages. Submitted to SIAM Journal on Control and Optimization.

Osher, Stanley, and Chi-Wang Shu: *High order essentially non-oscillatory schemes for Hamilton-Jacobi equations.* <u>ICASE Report No. 90-13</u>, February 5, 1990, 27 pages. To appear in SIAM J. of Numerical Analysis.

Duck, Peter W., and Stephen J. Shaw: *The inviscid stability of supersonic flow past a sharp cone.* <u>ICASE Report No. 90-14</u>, February 7, 1990, 60 pages. To appear in Theoretical & Computational Fluid Dynamics.

Erlebacher, Gordon, M. Y. Hussaini, H. O. Kreiss, and S. Sarkar: *The analysis and simulation of compressible turbulence.* <u>ICASE Report No. 90-15</u>, February 8, 1990, 29 pages. Theoretical and Computational Fluid Dynamics, Vol. 2, No. 73, (1990).

Abarbanel, Saul S., Wai Sun Don, David Gottlieb, David H. Rudy, and James C. Townsend: *Secondary frequencies in the wake of a circular cylinder with vortex shedding.* <u>ICASE Report No. 90-16</u>, February 9, 1990, 26 pages. Submitted to Journal of Fluid Mechanics.

Decker, Naomi H.:*On the parallel efficiency of the Frederickson-McBryan Multigrid Algorithm.* <u>ICASE Report No. 90-17</u>, February 9, 1990, 10 pages. Submitted to SIAM Journal on Scientific and Statistical Computing.

Sarkar, S. and L. Balakrishnan: *Application of a Reynolds stress turbulence model to the compressible shear layer.* <u>ICASE Report No. 90-18</u>, February 28, 1990, 29 pages. AIAA Journal, in press.

Seddougui, S. O., R. I. Bowles, and F. T. Smith: *Surface - Cooling effects on compressible boundary-layer instability.* <u>ICASE Report No. 90-19</u>, February 28, 1990, 51 pages. To appear in European Journal of Mechanics B/Fluids, Vol. 10, No. 1, 1991.

Nicol, David M.: *The cost of conservative synchronization in parallel discrete event simulations.* <u>ICASE Report No. 90-20</u>, May 9, 1990, 31 pages. Submitted to the Journal of the ACM.

Nicol, David M.: *Performance Bounds on Parallel Self-Initiating Discrete-Event.* <u>ICASE Report No. 90-21</u>, March 2, 1990, 29 pages. To appear in ACM Transactions on Modelling and Computer Simulations.

Karageorghis, Andreas, and Timothy N. Phillips: *Conforming Chebyshev spectral collocation methods for the solution of laminar flow in a constricted channel.* <u>ICASE Report No. 90-22</u>, March 2, 1990, 45 pages. To appear in IMA Journal of Numerical Analysis (1991).

Rosen, I. G. and C. Wang: *On the continuous dependence with respect to sampling of the linear quadratic regulator problem for distributed parameter systems.* <u>ICASE Report No. 90-23</u>, March 6, 1990, 42 pages. To appear in SIAM Journal on Control and Optimization.

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Rosen, I. G. and Chien-Hua Frank Su: *An approximation theory for the identification of linear thermoelastic systems.* ICASE Report No. 90-24, March 7, 1990, 31 pages. To appear in Differential and Integral Equations.

Lafon, F. and S. Osher: *High order filtering methods for approximating hyperbolic systems of conservation laws.* ICASE Report No. 90-25, March 9, 1990, 36 pages. To appear in Journal of Computational Physics.

Speziale, Charles G.: *Analytical methods for the development of Reynolds stress closures in turbulence.* ICASE Report No. 90-26, March 21, 1990, 61 pages. Annual Review of Fluid Mechanics, Vol. 23, pp. 107-157 (1991).

Cai, Wei, David Gottlieb and Ami Harten: *Cell averaging Chebyshev methods for hyperbolic problems.* ICASE Report No. 90-27, March 28, 1990, 22 pages. To appear in Computer and Math with Application, special issue: Advance in P.D.E.

Karni, S.: *Viscous shock profiles and primitive formulations.* ICASE Report No. 90-28, March 29, 1990, 24 pages. Submitted to SIAM Journal of Numerical Analysis.

Don, Wai-Sun and David Gottlieb: *Spectral simulation of unsteady compressible flow past a circular cylinder.* ICASE Report No. 90-29, April 9, 1990, 25 pages. To appear in the Proceedings of the ICOSAHOM 1989.

Mavriplis, Dimitri J.: *Algebraic turbulence modeling for unstructured and adaptive meshes.* ICASE Report No. 90-30, May 3, 1990, 30 pages. To appear in AIAA Journal.

Denier, James P., Philip Hall and Sharon Seddougui: *On the receptivity problem for Görtler vortices: Vortex motions induced by wall roughness.* ICASE Report No. 90-31, May 8, 1990, 59 pages. To appear in Phil. Trans. R. Soc. Lond. A.

Bassom, Andrew P., and Philip Hall: *Concerning the interaction of non-stationary cross-flow vortices in a three-dimensional boundary layer.* ICASE Report No. 90-32, May 8, 1990, 36 pages. To appear in Quar. J. Appl. Math.

Mirchandaney, Seema, Joel Saltz, Piyush Mehrotra, and Harry Berryman: *A scheme for supporting automatic data migration on multicomputers.* ICASE Report No. 90-33, May 8, 1990, 18 pages. Proceedings of the Fifth Distributed Memory Computing Conference, Charleston, South Carolina, Vol. II, pp. 1028-1037, April 1990.

Saltz, Joel H., Ravi Mirchandaney and Kay Crowley: *Run-time parallelization and scheduling of loops.* ICASE Report No. 90-34, May 9, 1990, 24 pages. *Revised version of 88-70.* Excerpts in Proc. of the Third Int. Conf. on Supercomputing, Crete, Greece, June 1989 and in Proc. of the First Int. Symposium on Parallel Algorithms and Architectures, Santa Fe, NM. To appear in IEEE Trans. Computing.

Deville, Michel O., and Ernest H. Mund: *Fourier analysis of finite element preconditioned collocation schemes.* ICASE Report No. 90-35, May 9, 1990, 24 pages. Submitted to SIAM Journal on Scientific and Statistical Computing.

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Banks, H. T., and D. A. Rebnord: *Analytic semigroups: Applications to inverse problems for flexible structures.* ICASE Report No. 90-36, May 15, 1990, 17 pages. To appear in Proc. Intl. Conf. on Differential Equations & Applications, Lecture Notes in Pure and Appl. Math., Marcel Dekker, Inc., 1990.

Berger, M. J., and R. J. LeVeque: *Stable boundary conditions for Cartesian grid calculations.* ICASE Report No. 90-37, May 18, 1990, 16 pages. Symposium on Computational Technology for Flight Vehicles, edited by Ahmed Noor, Pergamon Press, 1990, pp. 305-311.

Bokhari, Shahid H.: *A network flow model for load balancing in circuit-switched multicomputers.* ICASE Report No. 90-38, May 18, 1990, 31 pages. Submitted to IEEE Transactions on Parallel and Distributed Systems.

Papageorgiou, D. T.: *The stability of two-dimensional shear-layers at high Mach numbers.* ICASE Report No. 90-39, May 24, 1990, 26 pages. To appear in Physics of Fluids A.

Blackaby, Nicholas, Stephen Cowley and Philip Hall: *On the instability of hypersonic flow past a flat plate.* ICASE Report No. 90-40, May 30, 1990, 52 pages. Submitted to Journal of Fluid Mechanics.

Berryman, Harry, Joel Saltz and Jeffrey Scroggs: *Execution time support for adaptive scientific algorithms on distributed memory machines.* ICASE Report No. 90-41, May 31, 1990, 20 pages. To appear in Concurrency, Practice and Experience.

Gottlieb, David, and Eitan Tadmor: *The CFL condition for spectral approximations to hyperbolic initial-boundary value problems.* ICASE Report No. 90-42, June 1, 1990, 27 pages. Mathematics of Computation, in press.

Burns, J. A., Z. Y. Liu and R. E. Miller: *Approximation of thermoelastic and viscoelastic control systems.* ICASE Report No. 90-43, June 1, 1990, 68 pages. To appear in Journal of Numerical Functional Analysis and Optimization.

Swanson, R. C., and Eli Turkel: *On central-difference and upwind schemes.* ICASE Report No. 90-44, June 15, 1990, 42 pages. Submitted to Journal of Computational Physics.

Burns, John A., and Sungkwon Kang: *A control problem for Burgers' equation with bounded input/output.* ICASE Report No. 90-45, June 13, 1990, 37 pages. To appear in Journal of Nonlinear Dynamics.

Speziale. Charles G., Ridha Abid, and E. Clay Anderson: *A critical evaluation of two-equation models for near wall turbulence.* ICASE Report No. 90-46, June 26, 1990, 28 pages. AIAA Journal, in press.

Cowley, Stephen J., Leon L. Van Dommelen: *On the use of Lagrangian variables in descriptions of unsteady boundary-layer separation.* ICASE Report No. 90-47, July 10, 1990, 67 pages. Philosophical Transactions of the Royal Society of London, Vol. A333, pp. 343-378, 1990.

Jones, Mark T., and Merrell L. Patrick: *The use of Lanczo's method to solve the large generalized symmetric eigenvalue problem in parallel.* ICASE Report No. 90-48, July 12, 1990, 28 pages.

Iqbal, M. Ashraf, and Shahid H. Bokhari: *Efficient algorithms for a class of partitioning problems.* ICASE Report No. 90-49, July 27, 1990, 26 pages. Submitted to IEEE Transactions on Parallel and Distributed Systems.

Platt, N., L. Sirovich, and N. Fitzmaurice: *An investigation of chaotic Kolmogorov flows.* ICASE Report No. 90-50, August 10. 1990, 77 pages. Submitted to Physics of Fluids.

Saylor, Paul E., and Robert D. Skeel: *Linear iterative solvers for implicit ODE methods.* ICASE Report No. 90-51, August 2, 1990, 21 pages. Proc. of the Copper Mountain Meeting on Iterative Methods, April 1990. Submitted to the SIAM Journal of Statistical and Scientific Computing.

Scroggs, Jeffrey S.: *Shock-layer bounds for a singularly perturbed equation.* ICASE Report No. 90-52, August 14, 1990, 12 pages. Submitted to SIAM Journal on Applied Mathematics.

Decker, Naomi H., Vijay K. Naik, and Michel Nicoules: *Parallelization of implicit finite difference schemes in computational fluid dynamics.* ICASE Report No. 90-53, August 16, 1990, 25 pages. Submitted to Proceedings of Copper Mountain Conference on Iterative Methods, 1990.

Decker, Naomi, and Eli Turkel: *Multigrid for hypersonic inviscid flows.* ICASE Report No. 90-54, August 16, 1990, 18 pages. To appear in Proceedings of 3rd International Conference on Hyperbolic Problems, 1990.

Shu, Chi-Wang: *Numerical experiments on the accuracy of ENO and modified ENO schemes.* ICASE Report No. 90-55, August 16, 1990, 25 pages. To appear in Journal of Scientific Computing.

Shu, Chi-Wang: *Numerical methods for systems of conservation laws of mixed type using flux splitting.* ICASE Report No. 90-56, August 16, 1990, 17 pages. Submitted to Journal of Computational Physics.

Geer, James F., and Carl M. Andersen: *A hybrid perturbation-Galerkin technique for partial differential equations.* ICASE Report No. 90-57, August 16, 1990, 29 pages. To appear in the Proceedings of the Workshop on Asymptotic Analysis and Numerical Solution of PDEs.

Ng, Lian, and G. Erlebacher: *Secondary instabilities in compressible boundary layers.* ICASE Report No. 90-58, September 6, 1990, 52 pages. Submitted to Physics of Fluids.

Saltz, Joel, Harry Berryman, and Janet Wu: *Multiprocessors and runtime compilation.* ICASE Report No. 90-59, September 21, 1990, 23 pages. Submitted to Concurrency, Practice and Experience.

Nicol, David, Subhendu Das, and Dan Palumbo: *Parallelized reliability estimation of reconfigurable computer networks.* ICASE Report No. 90-60, September 10, 1990, 24 pages. Submitted to IEEE Trans. on Software Engineering.

Mavriplis, Dimitri J.: *Turbulent flow calculations using unstructured and adaptive meshes.* ICASE Report No. 90-61, September 10, 1990, 32 pages. To appear in Journal of Numerical Methods in Fluids.

Bodonyi, R. J., and P. W. Duck: *Boundary-layer receptivity due to a wall suction and control of Tollmien-Schlichting waves.* ICASE Report No. 90-62, September 19, 1990, 33 pages. Submitted to Physics of Fluids.

Nicol, David M.: *Inflated speedups in parallel simulations via malloc().* ICASE Report No. 90-63, September 28, 1990, 17 pages. To appear in International Journal of Simulation.

Nicol, David: *Conservative parallel simulation of priority class queueing networks.* ICASE Report No. 90-64, September 28, 1990, 23 pages. Submitted to IEEE Trans. on Parallel and Distributed Systems.

Morris, K. A., and J. N. Juang: *Dissipative controller designs for second-order dynamic systems.* ICASE Report No. 90-65, September 28, 1990, 16 pages.

Bernard, Peter S., and Charles G. Speziale: *Bounded energy states in homogeneous turbulent shear flow – An alternative view.* ICASE Report No. 90-66, October 2, 1990, 35 pages. Submitted to Physics of Fluids A.

Nicol, David M., and Scott E. Riffe: *A "conservative" approach to parallelizing the sharks world simulation.* ICASE Report No. 90-67, October 2, 1990, 14 pages. To appear 1990 Winter Simulation Conf. Proceedings.

Schochet, Steven, and Eitan Tadmor: *Regularized Chapman-Enskog expansion for scalar conservation laws.* ICASE Report No. 90-68, October 2, 1990, 19 pages. Submitted to the Archive for Rational Mechanics and Analysis.

Mehrotra, Piyush, and John Van Rosendale: *Programming distributed memory architectures using Kali.* ICASE Report No. 90-69, October 3, 1990, 23 pages. Proceedings of the Workshop on Languages and Compilers for Parallel Computers, MIT/Pitman Press, Fall 1990.

Koelbel, Charles, and Piyush Mehrotra: *Compiling global name-space programs for distributed execution.* ICASE Report No. 90-70, October 4, 1990, 36 pages. Submitted to IEEE Transactions on Parallel and Distributed Computing, Special Issue June 1991.

Hall, Philip, and Nicola J. Horseman: *The inviscid secondary instability of fully nonlinear longitudinal vortex structures in growing boundary layers.* ICASE Report No. 90-71, October 10, 1990, 41 pages. Submitted to Journal of Fluid Mechanics.

Bassom, Andrew P., and Philip Hall: *Vortex instabilities in 3D boundary layers: The relationship between Görtler and crossflow vortices.* ICASE Report No. 90-72, October 11, 1990, 76 pages. Submitted to Journal of Fluid Mechanics.

Abarbanel, Saul, and David Gottlieb: *Spurious frequencies as a result of numerical boundary treatments*. ICASE Report No. 90-73, October 12, 1990, 28 pages. To appear in the Proceedings of the Third International Conference on Hyperbolic Systems (invited paper).

Gottlieb, D., and C. L. Streett: *Quadrature imposition of compatability conditions in Chebyshev methods*. ICASE Report No. 90-74, October 12, 1990, 18 pages. Submitted to Journal of Scientific Computing.

Roe, P. L.: *"Optimum" upwind advection on a triangular mesh*. ICASE Report No. 90-75, October 15, 22 pages. To be submitted to Journal of Computational Physics.

Erlebacher, G., M. Y. Hussaini, C. G. Speziale, and T. A. Zang: *Toward the large-eddy simulation of compressible turbulent flows*. ICASE Report No. 90-76, October 16, 1990, 45 pages. Submitted to the Journal of Fluid Mechanics.

Jacobs, P. A., R. C. Rogers, E. H. Weidner, and R. D. Bittner: *Flow establishment in a generic scramjet combustor*. ICASE Report No. 90-77, October 16, 1990, 40 pages. Submitted to the AIAA Journal of Propulsion and Power. Presented at the 26th AIAA/ASME Joint Propulsion Conference, Orlando, July, 1990.

Papageorgiou, Demetrius T., and Yiorgos S. Smyrlis: *The route to chaos for the Kuramoto-Sivashinsky equation*. ICASE Report No. 90-78, October 19, 1990, 55 pages. Submitted to Theoretical and Computational Fluid Dynamics.

Smith, R. C., K. L. Bowers and J. Lund: *A fully Sinc-Galerkin method for Euler-Bernoulli beam models*. ICASE Report No. 90-79, October 23, 1990, 44 pages. Submitted to Numerical Methods for Partial Differential Equations.

Piomelli, Ugo, and Thomas A. Zang: *Large-eddy simulation of transitional channel flow*. ICASE Report No. 90-80, November 5, 1990, 14 pages. To appear in Computer Physics Communications.

Shaw, Stephen J., and Peter W. Duck: *The inviscid stability of supersonic flow past heated or cooled axisymmetric bodies*. ICASE Report No. 90-81, November 30, 1990, 53 pages. Submitted to Physics of Fluids.

Jackson, T. L., and C. E. Grosch: *Zero wavenumber modes of a compressible supersonic mixing layer*. ICASE Report No. 90-82, December 3, 1990, 12 pages. Submitted to Physics of Fluids A.

Liandrat, J., and Ph. Tchamitchian: *Resolution of the 1D regularized Burgers equation using a spatial wavelet approximation*. ICASE Report No. 90-83, December 5, 1990, 36 pages. Submitted to Annales Institut Henri Poincaré.

Denier, J. P., and Philip Hall: *The effect of wall compliance on the Görtler vortex instability*. ICASE Report No. 90-84, December 6, 1990, 15 pages. Submitted to Physics of Fluids.

Fu, Yibin B., Philip Hall, and Nicholas D. Blackaby: *On the Görtler instability in hypersonic flows: Sutherlcnd law fluids and real gas effects*. ICASE Report No. 90-85, December 11, 1990, 70 pages. Submitted to Proc. Roy. Soc.

Hall, Philip, and P. Balakumar: *On a class of unsteady three-dimensional Navier Stokes solutions relevant to rotating disc flows: Threshold amplitudes and finite time singularities*. ICASE Report No. 90-86 December 10, 1990, 45 pages. Submitted to JFM.

Garbey, Marc, and Jeffrey S. Scroggs: *Asymptotic-Induced numerical methods for conservation laws*. ICASE Report No. 90-87, December 12, 1990, 24 pages. Proceedings of Asymptotic Analysis and Numerical Solution of Partial Differential Equations.

Speziale, Charles G., Rishi Raj, and Thomas B. Gatski: *Modeling the dissipation rate in rotating turbulent flows*. ICASE Report No. 90-88, December 12, 1990, 28 pages. To appear in Recent Developments in Turbulence, (Springer-Verlag).

Balakumar, P., P. Hall, and M. R. Malik: *On the receptivity and non-parallel stability of travelling disturbances in rotating disk flow*. ICASE Report No. 90-89, December 12, 1990, 31 pages. To appear in Theoretical and Computational Fluid Dynamics.

Narasimha, R.: *Modelling the transitional boundary layer*. ICASE Report No. 90-90, December 17, 1990, 22 pages. Submitted to Applied Mechanics Review.

ICASE Reports - 1989

Tomboulian, Sherryl: *Spectral solution of the incompressible Navier-Stokes equations on the connection machine2*. ICASE Report No. 89-1, January 2, 1989, 12 pages. Proc. of Supercomputing 1988, November 1988, Orlando, Florida.

Speziale, Charles G.: *On the freestream matching condition for stagnation point turbulent flows*. ICASE Report No. 89-2, January 4, 1989, 1⁻ pages. Forum on Turbulent Flows, ASME FED, Vol. 76, 1989, pp. 19-24.

Banks, H. T., C. K. Lo, Simeon Reich, and I. G. Rosen: *Numerical studies of identification in nonlinear distributed parameter system*. ICASE Report No. 89-3, January 6, 1989, 19 pages. Proc. of Fourth International Conf. on Control and Identification of Distributed Parameter Systems, Birkhäuser Verlag, Basel, 1989, pp. 1-20.

Banks, H. T. and C. Wang: *Optimal feedback control of infinite dimensional parabolic evolution systems: approximation techniques*. ICASE Report No. 89-4, January 6, 1989, 59 pages, SIAM J. Control & Opt., Vol. 27, 1989, pp. 1182-1219.

Quarteroni, Alfio: *Domain decomposition methods for systems of conservation laws: Spectral collocation approximations*. ICASE Report No. 89-5, January 19, 1989, 36 pages. Submitted to SIAM J. Scientific and Statistical Computing.

ones, Mark T.. Merrell L. Patrick, and Robert G. Voigt: *A language comparison for scientific computing on MIMD architectures.* ICASE Report No. 89-6, January 24, 1989, 39 pages. Aspects of Computation on Asynchronous Parallel Processors, M. H. Wright (Editor), Elsevier Science Publishers B. V. (North-Holland), IFIP, 1989.

Crowley, Kay, Joel Saltz, Ravi Mirchandaney, and Harry Berryman: *Run-time scheduling and execution of loops on message passing machines* ICASE Report No. 89-7, January 31, 1989, 25 pages. Journal of Parallel and Distributed Computing, Vol. 8, pp. 303-312, April 1990.

Geer, James F. and Carl M. Andersen: *A hybrid-perturbation-Galerkin technique which combines multiple expansions.* ICASE Report No. 89-8, January 31, 1989, 37 pages. SIAM J. Appl. Math., Vol. 50, No. 5, pp. 1474-1495, 1990.

Zang, Thomas A., Steven E. Krist, and M. Y. Hussaini: *Resolution requirements for numerical simulations of transition.* ICASE Report No. 89-9, January 31. 1989, 30 pages. J. Scientific Computing, Vol. 4, pp. 197-217.

Sarkar, Sutanu and Charles G. Speziale: *A simple nonlinear model for the return to isotropy in turbulence.* ICASE Report No. 89-10, February 9, 1989, 28 pages Physics of Fluids, Part A, Vol. 2, January 1990, pp. 84-93.

Mavriplis, Dimitri, A. Jameson, and L. Martinelli: *Multigrid solution of the Navier-Stokes equations on triangular meshes.* ICASE Report No. 89-11, February 9, 1989, 13 pages. To appear in AIAA Journal.

Protzel, P., D. Palumbo, and M. Arras: *Fault-tolerance of a neural network solving the traveling salesman problem.* ICASE Report No. 89-12, February 16, 1989, 14 pages. Intern. Joint Conf. on Neural Networks.

Zang, Thomas A., Craig Streett, and M. Yousuff Hussaini: *Spectral methods for CFD.* ICASE Report No. 89-13, February 17, 1989, 69 pages. von Karman Institute Lecture Survey on Computation Fluid Dynamics March 6-10, 1989.

Du, Yuh-Roung and S. S. Sritharan: *Analysis of regularized Navier-Stokes equations - II.* ICASE Report No. 89-14, February 17, 1989, 68 pages. Submitted to Quarterly of Applied Mathematics.

Erlebacher, Gordon and M. Y. Hussaini: *Non-linear evolution of a second mode wave in supersonic boundary layers.* ICASE Report No. 89-15, February 28, 1989, 39 pages. To appear in Applied Numerical Mathematics.

Banks, H. T., Simeon Reich, and Rosen, I. G.: *Estimation of nonlinear damping in second order distributed parameter systems.* ICASE Report No. 89-16, August 9, 1989, 31 pages. Control Theory and Advanced Technology, Vol. 6, 1990, pp. 395-416.

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Nicol, David: *Parallel solution of sparse one-dimensional dynamic programming problems.* ICASE Report No. 89-17, March, 1989, 22 pages. ORSA Journal on Computing, Vol. 2, No. 2, 1990, pp. 162-173

Jackson, T. L. and C. E. Grosch: *Inviscid spatial stability of a compressible mixing layer part II. The flame sheet model.* ICASE Report No. 89-18, March 20, 1989, 32 pages. Journal of Fluid Mechanics, Vol. 217, 1990, pp. 391-420.

Duck, Peter: *The inviscid axisymmetric stability of the supersonic flow along a circular cylinder.* ICASE Report No. 89-19, February, 1989, 73 pages. Journal of Fluid Dynamics, Vol. 214, pp. 611-637, (1990).

Mehrotra, Piyush and John Van Rosendale: *Compiling high level constructs to distributed memory architectures.* ICASE Report No. 89-20, March 7, 1989, 12 pages. Proceedings of the Fourth Hypercube Multiprocessors Conference, Monterey, CA, March 1989.

Malik, M. R. and M. Y. Hussaini: *Numerical simulation of Görtler/Tollmein-Schlichting wave-interaction.* ICASE Report No. 89-21, March 22, 1989, 30 pages. Journal of Fluid Mechanics, Vol. 210, 1990, pp. 183-200.

Banks, H. T., R. H. Fabiano, and Y. Wang: *Inverse problem techniques for beams with tip body and time hysteresis camping.* ICASE Report No. 89-22, April 18, 1989. 24 pages. To appear in Matematica Aplicada e Computacional.

Hall, Philip and Yibin Fu: *On the Görtler vortex instability mechanism at hypersonic speeds.* ICASE Report No. 89-23, May 10, 1989, 24 pages. Theoretical and Computational Fluid Dynamics, Vol. 3, No. 1, pp. 125-134.

Decker, Naomi and John Van Rosendale: *Operator induced multigrid algorithm using semirefinement.* ICASE Report No. 89-24, April 20, 1989. Proceedings of the Fourth Copper Mountain Conference on Multigrid Methods, J. Mandel et. al., eds., 1989, Society for Industrial and Applied Mathematics, pp. 87-105.

Hur, N., S. Thangam and C. G. Speziale: *Numerical study of turbulent secondary flows in curved ducts.* ICASE Report No. 89-25, April 13, 1989, 26 pages. ASME J. Fluids Engng., Vol. 112, pp. 205-211 (1990).

Kojima, Fumio: *Shape identification technique for a two-dimensional elliptic system by boundary integral equation method.* ICASE Report No. 89-26, April 13, 1989, 23 pages. To appear in Proc. 5th IFAC Symp. on Control of Distribute Parameter Systems, Pergignan, France.

Middleton, David: *Implementing nested conditional statements in SIMD machines.* ICASE Report No. 89-27, April 18, 1989, 16 pages.

Tanveer, Saleh: *Analytic theory for the determination of velocity and stability of bubbles in a Hele-Shaw cell. Part I: velocity selection.* ICASE Report No. 89-28, April 25, 1989, 57 pages. Theoretical and Computational Fluid Dynamics, 1989, Vol. 1, No. 3, pp. 135-163.

Tanveer, Saleh: *Analytic theory for the determination of velocity and stability of bubbles in a Hele-Shaw cell. Part II: Stability.* ICASE Report No. 89-29, April 25, 1989, 24 pages. Theoretical and Computational Fluid Dynamics, 1989, Vol. 1, No. 3, pp. 165-177.

Middleton, David and Sherryl Tomboulian: *Evaluating local indirect addressing in SIMD processors.* ICASE Report No. 89-30, May 2, 1989, 19 pages.

Tanveer, Saleh: *Analytic theory for the selection of 2-D needle crystal at arbitrary peclet number.* ICASE Report No. 89-31, May 5, 1989, 30 pages. Phys. Rev. A, Vol. 4, No. 8, pp. 4756-4769.

Jackson, T. L. and C. E. Grosch: *Inviscid spatial stability of a compressible mixing layer. Part III. Effect of thermodynamics.* ICASE Report No. 89-32, June, 1989, 46 pages. To appear in Journal of Fluid Mechanics.

Tomboulian, Sherryl: *Indirect addressing and load balancing for faster solution to Mandelbrot set on SIMD architectures.* ICASE Report No. 89-33, May 5, 1989, 10 pages. Proceedings of the Conference on Frontiers of Massively Parallel Processing.

Hall, Philip and Andrew P. Bassom: *On the interaction of stationary crossflow vortices and Tollmien-Schlichting waves in the boundary layer on a rotating disc.*
ICASE Report No. 89-34, April 25, 1989, 39 pages. Proc. Roy Soc., Series A, Vol. 430, pp. 25-53.

Mavriplis, Dimitri: *Zonal multigrid solution of compressible flow problems on unstructured and adaptive meshes.* ICASE Report No. 89-35, May 1, 1989, 25 pages.

Bernardi, Christine and Yvon Maday: *Some spectral approximations of monodimensional fourth-order problems.* ICASE Report No. 89-36, June, 1989, 78 pages. To appear in Journal of Approximation Theory.

Jones, Mark T. and Merrell L. Patrick: *Bunch-Kaufman factorization for real symmetric indefinite banded matrices.* ICASE Report No. 89-37, May 20, 1989, 14 pages. Submitted to SIAM Journal for Matrix Analysis and Application.

Jackson, T.L. and C. E. Grosch: *Absolute/convective instabilities and the convective mach number in a compressible mixing layer.* ICASE Report No. 89-38, June 14, 1989, 21 pages. Physics of Fluids A, Vol. 2(6), 1990, pp. 949-954.

Lakin, William D. and Raymond G. Kvaternik: *An integrating matrix formulation for buckling of rotating beams including the effects of concentrated masses.* ICASE Report No. 89-39, May 22, 1989, 23 pages. Int. J. Mechanical Sciences, 1989, Vol. 31, No. 8, pp. 569-577.

Naik, Vijay K. and Merrell L. Patrick: *Data traffic reduction schemes for cholesky factorization on asynchronous multiprocessor systems.* ICASE Report No. 89-40, June 1, 1989, 31 pages. Proceedings of ACM 1989 International Conference on Supercomputing, June 5-9, 1989, Crete, Greece.

Mehrotra, Piyush and John Van Rosendale: *Parallel language constructs for tensor product computations on loosely coupled architectures.* ICASE Report No. 89-41, June 2, 1989, 32 pages. Submitted to the Journal of Parallel and Distributed Computing, August 1989.

Landriani, G. Sacchi and H. Vandeven: *A multidomain spectral collocation method for the Stokes problem.* ICASE Report No. 89-42, June 5, 1989, 31 pages.

Speziale, C. G., T. B. Gatski, and N. Mac Giolla Mhuiris: *A critical comparison of turbulence models for homogeneous shear flows in a rotating frame.* ICASE Report No. 89-43, June 5, 1989, 23 pages. Proceedings of the Seventh Symposium on Turbulent Shear Flows (Stanford University, August 21-23, 1989), Vol. 2, 1989, pp. 27.3.1-27.3.6.

Banks, H. T., Fumio Kojima and W. P. Winfree: *Boundary estimation problems arising in thermal tomography.* ICASE Report No. 89-44, November 13, 1989, 42 pages. To appear in Inverse Problems.

Carter, Richard: *Numerical optimization in Hilbert Space using inexact function and gradient evaluations.* ICASE Report No. 89-45, June 5, 1989, pages. Submitted to SIAM Journal on Control and Optimizations.

Carter, Richard: *Numerical experience with a class of algorithm for nonlinear optimization using inexact function and gradient information.* ICASE Report No. 89-46, June 10, 1989, pages. Submitted to Mathematics of Computation.

Hall, Phillip and F. T. Smith: *Near-planar TS waves and longitudinal vortices in channel flow: Nonlinear interaction and streaks.* ICASE Report No. 89-47, September, 1989, 36 pages. Proc. ICASE workshop on Stability and Transition, Edited by M. Y. Houssaini and R. G. Voigt, Springer-Verlag, pp. 5-39, 1990.

Bernardi, Christine, Vivette Girault, and Laurence Halpern: *Variational formulation for a nonlinear elliptic equation in a three-dimensional exterior domain.* ICASE Report No. 89-48, July 11, 1989, 15 pages. Submitted to Nonlinear Analysis JMA, July 1989.

Geer, James F. and Carl M. Andersen: *A hybrid-perturbation-Galerkin method for differential equations containing a parameter.* ICASE Report No. 89-49, June 20, 1989, 27 pages. Applied Mechanics Review, 1989, Vol. 42, No. 11, pp. 69-77.

Seddougui, Sharon: *A nonlinear investigation of the stationary mode of instability of the three-dimensional compressible boundary layer due to a rotating disc.* ICASE Report No. 89-50, June 21, 1989, 29 pages. Quarterly Journal of Mechanics and Applied Mathematics, Vol. 43, Pt. 4, pp. 467-497, 1990.

Maestrello, L. and L. Ting: *Optimum shape of a blunt forebody in hypersonic flow.* ICASE Report No. 89-51, November 27, 1989, 21 pages. To be submitted to AIAA Journal.

Fatemi, Emad, Jerome Joseph, and Stanley Osher: *Solution of the hydrodynamic device model using high-order non-oscillatory shock capturing algorithms.* ICASE Report No. 89-52,

July 1, 1989, 71 pages. To appear in IEEE Transactions on Computer Aided Design of Integrated Systems and Circuits.

Osher, Stanley: *The nonconvex multi-dimensional Riemann problem for hamilton-Jacobi equations.* ICASE Report No. 89-53, July 13, 1989, 10 pages. To appear in SIAM Journal on Analysis; now co-authored with M. Bardi.

Berryman, Harry, Joel Saltz, William Gropp, and Ravi Mirchandaney: *Krylov methods preconditioned with incompletely factored matrices on the CM-2.* ICASE Report No. 89-54, December 21, 1989, 11 pages. Journal of Parallel and Distributed Computing, Vol. 8, pp. 186-190, February 1990.

Piomelli, Ugo, Thomas A. Zang, Charles G. Speziale, and M. Y. Hussaini: *On the large-eddy simulation of transitional wall-bounded flows.* ICASE Report No. 89-55, July 28, 1989, 28 pages. Physics of Fluids, A., Vol. 2, 1990, pp. 257-265.

Maday, Yvon and Einar M. Rønquist: *Optimal error analysis of spectral methods with emphasis on non-constant coefficients and deformed geometries.* ICASE Report No. 89-56, September, 1989, 23 pages. Proceedings of the ICOSAHOM Meeting 1989, in press 1990.

Ho, Lee-Wing, Yvon Maday, Anthony T. Patera, and Einar M. Rønquist: *A high-order Lagrangian-decoupling method for the incompressible Navier-Stokes equations.* ICASE Report No. 89-57, September, 1989, 47 pages. Proceedings of the ICOSAHOM Meeting 1989, in press 1990.

Speziale, Charles G.: *Discussion of turbulence modeling: Past and future.* ICASE Report No. 89-58, August 1, 1989, 25 pages. Lecture Notes in Physics, Vol. 357, pp. 490-512 (1990).

Funaro, Daniele and David Gottlieb: *Convergence results for pseudospectral approximations of hyperbolic systems by a penalty type boundary treatment.* ICASE Report No. 89-59, August 1, 1989, 20 pages. To appear in Mathematics of Computation.

Phillips, Timothy N. and Andreas Karageorghis: *A conforming spectral collocation strategy for Stokes flow through a channel contraction.* ICASE Report No. 89-60, August 9, 1989, 30 pages. To appear in Applied Numerical Mathematics (1991).

Hussaini, M. Y., C. G. Speziale, and T. A. Zang: *Discussion of "The potential and limitations of direct and large-eddy simulations."* ICASE Report No. 89-61, August 9, 1989, 17 pages. Lecture Notes in Physics, Vol. 357, J. L. Lumley (ed.), 1990, pp. 354-368.

Scroggs, Jeffrey S.: *An iterative method for systems of nonlinear hyperbolic equations.* ICASE Report No. 89-62, August 11, 1989, 13 pages. To appear in Computers and Mathematics with Applications.

Tanveer, S.: *Analytic theory for the selection of Saffman-Taylor fingers in the presence of thin film effects.* ICASE Report No. 89-63, September 14, 1989, 58 pages. To appear in Proc. Roy. Society, Series A.

Banks, H. T. and D. J. Inman: *On damping mechanisms in beams.* ICASE Report No. 89-64, September 14, 1989, 25 pages. Submitted to J. of Applied Mechanics.

Karageorghis, A. and T. N. Phillips: *On the coefficients of differentiated expansions of ultra-spherical polynomials.* ICASE Report No. 89-65, September 25, 1989, 10 pages. Submitted to Mathematics of Computation.

Papageorgiou, D. T.: *Linear instability of supersonic plane wakes.* ICASE Report No. 89-66, September 25, 1989, 46 pages. Theoretical and Computational Fluid Dynamics, 1990, Vol. 1, pp. 327-348.

Tadmor, Eitan: *Shock capturing by the spectral viscosity method.* ICASE Report No. 89-67, September 25, 1989, 13 pages. To appear in "Computer Methods in Applied Mechanics and Engineering" (Proceedings of the ICOSAHOM Meeting, Como, Italy, June 1989), Computer Methods in Applied Mechanics and Engineering, Vol. 78, 1990, pp.197-208.

Jackson, T. L., A. K. Kapila, and M. Y. Hussaini: *Convection of a pattern of vorticity through a reacting shock wave.* ICASE Report No. 89-68, September 27, 1989, 31 pages. Physics of Fluids A, Vol. 2(7), July 1990, pp. 1260-1268.

Jones, Mark T. and Merrell L. Patrick: *The use of Lanczos's method to solve the large generalized symmetric definite eigenvalue problem.* ICASE Report No. 89-69, September 26, 1989, 59 pages.

Robert G. Voigt: *Requirements of multidisciplinary design of aerospace vehicles high performance computers.* ICASE Report No. 89-70, September 26, 1989, 11 pages. Proceedings of the NATO Advanced Research Workshop on Supercomputing.

Kosloff, Dan and Hillel Tal-Ezer: *Modified Chebyshev pseudospectral method with* $O(N^{-1})$ *time step restriction.* ICASE Report No. 89-71, December 5, 1989, 27 pages. Submitted to Journal of Computational Physics.

Daniele Funaro: *Computational aspects of pseudospectral Laguerre approximations.* ICASE Report No. 89-72, November 27, 1989, 17 pages. Applied Mathematics Computation.

T. L. Freeman: *Parallel projected variable metric algorithms for unconstrained optimization.* ICASE Report No. 89-73, November 27, 1989, 13 pages. A modified version is to appear in Applied Numerical Mathematics.

Maestrello, L., A. Bayliss and R. Krishnan: *Numerical study of three-dimensional spatial instability of a supersonic flat plate boundary layer.* ICASE Report No. 89-74, October 6 ,1989, 19 pages. Submitted to Physics of Fluids.

Brewer, Dennis W., John A. Burns, and Eugene M. Cliff: *Parameter identification for an abstract Cauchy problem by quasilinearization.* ICASE Report No. 89-75, October 13, 1989, 35 pages. To appear in the Quarterly Journal of Applied Mathematics.

Nicolaides, R. A.: *Direct discretization of planar div-curl problems.* ICASE Report No. 89-76, October 23, 1989, 31 pages. To appear in SIAM Journal of Numerical Analysis.

Bassom, Andrew P. and Sharon O. Seddougui: *A note concerning the onset of three dimensionality and time dependence in Görtler vortices.* ICASE Report No. 89-77, October 31, 1989, 28 pages. Journal of Fluid Mechanics, 1990, Vol. 220, pp. 661-672.

Zang, Thomas A. and M. Yousuff Hussaini: *Multiple paths to subharmonic laminar breakdown in a boundary layer.* ICASE Report No. 89-78, October 31, 1989, 14 pages. Physics Review Letters, in press.

S. Sarkar, G. Erlebacher, M.Y. Hussaini, and H.O. Kreiss: *The analysis and modeling of dilatational terms in compressible turbulence.* ICASE Report No. 89-79, December 6, 1989, 33 pages. Journal of Fluid Mechanics, in press.

Eitan Tadmor: *Local error estimates for discontinuous solutions of nonlinear hyperbolic equations.* ICASE Report No. 89-80, December 6, 1989, 21 pages. SIAM J. Numer. Anal., in press.

Philip Hall: *Görtler vortices in growing boundary layers: The leading edge receptivity problem, linear growth and the nonlinear breakdown stage.* ICASE Report No. 89-81, December 14, 1989, 74 pages. Mathematica, Vol. 120, pp. 1-50.

Philip Hall and Frank T. Smith: *On strongly nonlinear vortex/wave interaction in boundary-layer transition.* ICASE Report No. 89-82, December 20, 1989, 36 pages. To appear in Journal of Fluid Mechanics.

ICASE Reports - 1988

Brewer, D. W. and J. S. Gibson: *Parameter identification and sensitivity analysis for a robotic manipulator arm.* ICASE Report No. 88-1, December 22, 1987, 30 pages. Submitted to Journal of Measurement, Dynamics, and Control.

Nicol, David M.: *Parallel algorithms for mapping pipelined and parallel computations.* ICASE Report No. 88-2, April 1, 1988, 34 pages. To appear in IEEE Trans. Comput.

Tomboulian, Sherryl: *Introduction to a system for implementing neural net connections on SIMD architectures.* ICASE Report No. 88-3, January 11, 1988, 15 pages. Proc. 1987 Conference on Neural Information Processing Systems, published by A.I.P., Dana Z. Anderson, editor, 1988, pp. 804-813.

Maday, Yvon and Eitan Tadmor: *Analysis of the spectral vanishing viscosity method for periodic conservation laws.* ICASE Report No. 88-4, January 11, 1988, 36 pages. SIAM Journal of Numerical Analysis, Vol. 26, No. 4, August 1989, pp. 854-870.

Fatoohi, Raad A. and Chester E. Grosch: *Implementation and analysis of a Navier-Stokes algorithm on parallel computers.* ICASE Report No. 88-5, January 11, 1988, 31 pages. Proceedings of 1988 International Conference on Parallel Processing, Vol. III, (D. H. Bailey, ed.), Pennsylvania State University Press, 1988, pp. 235-242.

Tomboulian, Sherryl, Thomas W. Crockett, and David Middleton: *A visual programming environment for the Navier-Stokes computer.* ICASE Report No. 88-6, January 11, 1988, 18 pages. Proceedings of the 1988 International Conference on Parallel Processing, Vol. II, August 1988, pp. 67-71.

Saylor, Paul E.: *Leapfrog variants of iterative methods for linear algebraic equations.* ICASE Report No. 88-7, January 13, 1988, 63 pages. J. Comput. Applied Math., 1988, Vol. 24, pp. 169-193.

Henshaw, W. D., H. O. Kreiss, and L. G. Reyna: *On the smallest scale for the incompressible Navier-Stokes equations.* ICASE Report No. 88-8, January 20, 1988, 48 pages. Theoretical and Computational Fluid Dynamics, 1989, Vol. 1, pp. 65-95.

Fennell, Robert E.: *An application of eigenspace methods to symmetric flutter suppression.* ICASE Report No. 88-9, January 21, 1988, 21 pages. Proc. AIAA Guidance, Navigation, and Control Conference, August 1988. Submitted to Journal of Guidance Control & Dynamics

Duck, P. W. and P. Hall: *On the interaction of Tollmien-Schlichting waves in axisymmetric supersonic flows.* ICASE Report No. 88-10, January 21, 1988, 20 pages. Quart. J. Mech. Appl. Math., Vol. 42, Pt. 1, 1989, pp. 115-130.

Quarteroni, Alfio and Giovanni Sacchi-Landriani: *Domain decomposition preconditioners for the spectral collocation method.* ICASE Report No. 88-11, January 22, 1988, 37 pages. Submitted to J. Scientific Computing.

Banks, H. T. and K. Ito: *A unified framework for approximation in inverse problems for distributed parameter systems.* ICASE Report No. 88-12, January 25, 1988, 33 pages. Control Theory and Advanced Technology, 1988, Vol. 4, pp. 73-90.

Abarbanel, Saul and Ajay Kumar: *Compact high order schemes for the Euler equations.* ICASE Report No. 88-13, February 10, 1988, 16 pages. J. of Scientific Computing, Vol. 3, No. 3, Sept. 1988.

Naik, Vijay K. and Merrell L. Patrick: *Data traffic reduction schemes for sparse Cholesky factorizations.* ICASE Report No. 88-14, February 10, 1988, 34 pages. Submitted to Int. Supercomputing Conf.

Gottlieb, David and Richard Hirsh: *Parallel pseudospectral domain decomposition techniques.* ICASE Report No. 88-15, February 17, 1988, 28 pages. To appear in Journal of Scientific Computing.

Koelbel, Charles, Piyush Mehrotra, and John Van Rosendale: *Semi-automatic process partitioning for parallel computation.* ICASE Report No. 88-16, February 22, 1988, 22 pages. International Journal of Parallel Programming, Vol. 16, No. 5, 1987, pp. 365-382.

Yang, Y. P. and J. S. Gibson: *Adaptive control of a manipulator with a flexible link.* ICASE Report No. 88-17, February 26, 1988, 19 pages. Journal of Robotic Systems, June 1989, Vol. 6, pp. 217-232.

Speziale, Charles G.: *Turbulence modeling in non-inertial frames of reference.* ICASE Report No. 88-18, March 3, 1988, 51 pages. Theoretical & Computational Fluid Dynamics, Vol. 1, 1989, pp. 3-19.

Gill, Doron and Eitan Tadmor: *An $O(N^2)$ method for computing the eigensystem of $N \times N$ symmetric tridiagonal matrices by the divide and conquer approach.* ICASE Report No. 88-19, March 4, 1988, 24 pages. SIAM J. Sci. Stat. Comput., January 1990, Vol. 11, No. 1, pp. 161-173.

Zang, Thomas A. and M. Y. Hussaini: *Numerical experiments on the stability of controlled boundary layers.* ICASE Report No. 88-20, March 7, 1988, 51 pages. To be resubmitted to J. Fluid Mechanics.

Mehrotra, Piyush: *Programming parallel architectures: The BLAZE family of languages.* ICASE Report No. 88-21, March 7, 1988, 20 pages. Proceedings of the Third SIAM Conference on Parallel Processing for Scientific Computing, Los Angeles, CA, December 1987, pp. 289-299.

Hall, Philip and Sharon O. MacKerrell: *Wave interactions in a three-dimensional attachment line boundary layer.* ICASE Report No. 88-22, March 23, 1988, 34 pages. J. Fluid Mech., 1990, Vol. 217, pp. 367-390.

Banks, H. T. and Fumio Kojima: *Boundary shape identification problems in two-dimensional domains related to thermal testing of materials.* ICASE Report No. 88-23, March 30, 1988, 32 pages. Quart. Applied Math., Vol. 47, No. 2, 1989, pp. 273-293.

Shu, Chi-Wang and Stanley Osher: *Efficient implementation of essentially non-oscillatory shock capturing schemes, II.* ICASE Report No. 88-24, April 18, 1988, 62 pages. Journal of Computational Physics, Vol. 83, No. 1, July 1989, pp. 32-78

Murphy, K. A.: *Estimation of time- and state-dependent delays and other parameters in functional differential equations.* ICASE Report No. 88-25, April 26, 1988, 51 pages. SIAM J. Applied Math., Vol. 50, 1990, pp. 972-1000.

Banks, H. T., Simeon Reich, and I. G. Rosen: *An approximation theory for the identification of nonlinear distributed parameter systems.* ICASE Report No. 88-26, April 26, 1988, 37 pages. SIAM J. Control, Vol. 28, 1990, pp. 552-569.

Speziale, Charles G. and Nessan Mac Giolla Mhuiris: *On the prediction of equilibrium states in homogeneous turbulence.* ICASE Report No. 88-27, April 27, 1988, 44 pages. J. Fluid Mech., Vol. 209, 1989, pp. 591-615.

Kojima, Fumio: *Parameter estimation for boundary value problems by integral equations of the second kind.* ICASE Report No. 88-28, April 28, 1988, 40 pages. Proceedings of the IEEE 27th Conference on Decision and Control, Austin, Texas, pp. 2459-2464.

Nicol, David M.: *Parallel discrete-event simulation of FCFS stochastic queueing networks.* ICASE Report No. 88-29, May 24, 1988, 22 pages. Proceedings of SIGPLAN PPEALS Symposium, New Haven, CT, July 1988, pp. 124-137.

Turkel, Eli: *Accuracy versus convergence rates for a three dimensional multistage Euler code.* ICASE Report No. 88-30, May 4, 1988, 20 pages. 16th Jerusalem, ICAS Congress, ICAS-88-4.6.1, 1988.

Protzel, Peter W.: *Automatically generated acceptance test: A software reliability experiment.* ICASE Report No. 88-31, May 9, 1988, 21 pages. Proc. of the Second Workshop on Software Testing, Verification, and Analysis, Banff, Alberta, Canada, July 1988.

Arnone, A. and R. C. Swanson: *A Navier-Stokes solver for cascade flows.* ICASE Report No. 88-32, July 7, 1988, 27 pages. Submitted to Journal of Engineering for Gas Turbines and Power.

Jackson, T. L. and C. E. Grosch: *Spatial stability of a compressible mixing layer.* ICASE Report No. 88-33, June 7, 1988, 54 pages. J. Fluid Mech., Vol. 208, 1989, pp. 609-637.

Speziale, Charles G. and Nessan Mac Giolla Mhuiris: *Scaling laws for homogeneous turbulent shear flows in a rotating frame.* ICASE Report No. 88-34, June 7, 1988, 25 pages. Physics of Fluids, A, Vol. 1, 1989, pp. 294-301.

Rosen, I. G.: *Optimal discrete-time LQR problems for parabolic systems with unbounded input - approximation and convergence.* ICASE Report No. 88-35, June 9, 1988, 30 pages. Control-Theory and Advanced Technology, 1989, Vol. 5, pp. 277-300.

Bernstein, Dennis S. and I. G. Rosen: *Finite-dimensional approximation for optimal fixed-order compensation of distributed parameter systems.* ICASE Report No. 88-36, June 9, 1988, 23 pages. Optimal Control - Application and Methods, Vol. 11, 1990, pp. 1-20.

Cai, Wei, David Gottlieb, and Chi-Wang Shu: *Non-oscillatory spectral Fourier methods for shock wave calculations.* ICASE Report No. 88-37, June 10, 1988, 31 pages. Mathematics of Computation, Vol. 52, No. 186, April 1989, pp. 389-410.

Banks, H. T., Simeon Reich, and I. G. Rosen: *Galerkin approximation for inverse problems for nonautonomous nonlinear distributed systems.* ICASE Report No. 88-38, June 10, 1988, 21 pages. To appear in Applied Mathematics and Optimization.

18

Tal-Ezer, Hillel: *High degree interpolation polynomial in Newton form.* ICASE Report No. 88-39, June 13, 1988, 23 pages. To appear in SIAM J. Sci. Comput.

Mavriplis, Dimitri J.: *Accurate multigrid solution of the Euler equations on unstructured and adaptive meshes.* ICASE Report No. 88-40, June 17, 1988, 31 pages. AIAA Journal, Vol. 28, No. 2, pp. 213-221, Feb. 1990.

Tadmor, Eitan: *Semi-discrete approximations to nonlinear systems of conservation laws; Consistency and L^∞-stability imply convergence.* ICASE Report No. 88-41, July 7, 1988, 62 pages. Submitted to Math. Comp.

Duck, Peter W. and Philip Hall: *Nonaxisymmetric viscous lower branch modes in axisymmetric supersonic flows.* ICASE Report No. 88-42, July 28, 1988, 22 pages. J. Fluid Mech., 1990, Vol. 213, pp. 191-201.

Bassom, Andrew P. and Philip Hall: *On the generation of mean flows by the interaction of Görtler vortices and Tollmien-Schlichting waves in curved channel flows.* ICASE Report No. 88-43, August 1, 1988, 40 pages. Studies in Applied Math, Vol. 81, 1989, p. 185.

Morkovin, Mark V.: *Recent insights into instability and transition to turbulence in open-flow systems.* ICASE Report No. 88-44, August 16, 1988, 83 pages. To appear in Theoretical & Computational Dynamics.

Bennett, J., P. Hall, and F. T. Smith: *The strong nonlinear interaction of Tollmien-Schlichting waves and Taylor-Görtler vortices in curved channel flow.* ICASE Report No. 88-45, August 18, 1988, 34 pages. Submitted to J. Fluid Mech.

Hall, P. and F. T. Smith: *Nonlinear Tollmien-Schlichting/vortex interaction in boundary layers.* ICASE Report No. 88-46, August 19, 1988, 36 pages. Euro. J. Mech. B / Fluids, Vol. 8, 1989, p. 179.

Mavriplis, Dimitri J.: *Adaptive mesh generation for viscous flows using Delaunay triangulation.* ICASE Report No. 88-47, August 19, 1988, 15 pages. Proc. of the Second International Conference on Numerical Grid Generation in Computational Fluid Dynamics. Journal of Computational Physics, Vol. 90, No. 2, pp. 271-291, Oct. 1990.

Gibson, J. S. and A. Adamian: *Approximation theory for LQG optimal control of flexible structures.* ICASE Report No. 88-48, August 29, 1988, 120 pages. To appear in SIAM J. Control Optim., 1991.

Rosen, I. G.: *Convergence of Galerkin approximations for operator Riccati equations – A nonlinear evolution equation approach.* ICASE Report No. 88-49, August 29, 1988, 29 pages. To appear in J. Mathematical Analysis and Applications.

Ta'asan, Shlomo: *Multigrid method for stability problems.* ICASE Report No. 88-50, September 7, 1988, 17 pages. J. Sci. Comput., Vol. 3, No. 3, 1988, pp. 261-274.

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Nessyahu, Haim and Eitan Tadmor: *Non-oscillatory central differencing for hyperbolic conservation laws.* ICASE Report No. 88-51, September 6, 1988, 52 pages. J. Comp. Phys., 1990, Vol. 87, in press.

Keyes, David E.: *Domain decomposition methods for the parallel computation of reacting flows.* ICASE Report No. 88-52, September 15, 1988, 25 pages. Computer Physics Communications, Vol. 53, 1989, pp. 181-200.

Turkel, Eli: *Improving the accuracy of central difference schemes.* ICASE Report No. 88-53, September 7, 1988, 14 pages. 11th International Conference on Numerical Methods and Fluid Dynamics, Springer-Verlag Lecture Notes in Physics, 1988, Vol. 323, pp. 586-591.

Augenbaum, Jeffrey M.: *An adaptive pseudospectral method for discontinuous problems.* ICASE Report No. 88-54, September 12, 1988, 33 pages. Applied Numerical Mathematics, 1989, Vol. 5, pp. 459-480.

Gastaldi, Fabio and Alfio Quarteroni: *On the coupling of hyperbolic and parabolic systems: Analytical and numerical approach.* ICASE Report No. 88-55, October 5, 1988, 44 pages. Submitted to Applied Numerical Mathematics.

Decker, Naomi H. and Shlomo Ta'asan: *A simplified analysis of the multigrid V-cycle as a fast elliptic solver.* ICASE Report No. 88-56, November 4, 1988, 18 pages. Submitted to Math. Comp., but withdrawn.

Nicol, D. M., D. R. Shier, R. K. Kincaid, and D. S. Richards: *A multistage linear array assignment problem.* ICASE Report No. 88-57, November 21, 1988, 33 pages. To appear in Operations Research.

Nicol, David M. and James C. Townsend: *Accurate modeling of parallel scientific computations.* ICASE Report No. 88-58, November 30, 1988, 13 pages. Submitted to the 1989 Sigmetrics Conference.

Maday, Yvon, Cathy Mavriplis, and Anthony Patera: *Nonconforming mortar element methods: Application to spectral discretizations.* ICASE Report No. 88-59, October 19, 1988, 28 pages. Proceedings of the Second International Conference on Domain Decomposition Methods for PDE; T. Chan, R. Glowinski, J. Perianx, O. Widland, editors, SIAM Phildelphia, Chapter 31, pp. 392-618, 1989.

Scroggs, Jeffrey S. and Danny C. Sorensen: *An asymptotic induced numerical method for the convection-diffusion-reaction equation.* ICASE Report No. 88-60, October 21, 1988, 33 pages. Mathematics for Large Scale Computing, Julio C. Diaz (editor), pp. 81-114, 1989, Marcel-Decker.

Elliott, S. J. and P. A. Nelson: *Multiple point least squares equalisation in a room.* ICASE Report No. 88-61, October 28, 1988, 24 pages. J. Audio Eng. Soc., Vol. 37, No. 11, November 1989, pp. 899-907.

Scroggs, Jeffrey: *A physically motivated domain decomposition for singularly perturbed equations.* ICASE Report No. 88-62, November 1, 1988, 15 pages. SIAM J. Numer. Anal., Vol. 28, No. 1, 1991.

Rostand, Phillippe: *Algebraic turbulence models for the computation of two-dimensional high speed flows using unstructured grids.* ICASE Report No. 88-63, November 4, 1988, 43 pages. Submitted to Internat. J. Numer. Methods Fluids.

Jameson, Antony: *Aerodynamic design via control theory.* ICASE Report No. 88-64, November 21, 1988, 42 pages. Submitted to J. Sci. Comput.

Andersen, Carl M. and James F. Geer: *Investigating a hybrid perturbation-Galerkin technique using computer algebra.* ICASE Report No. 88-65, November 21, 1988, 26 pages. To appear in the Journal of Symbolic Compulation.

Smith, F. T.: *Nonlinear interaction of near-planar TS waves and longitudinal vortices in boundary-layer transition.* ICASE Report No. 88-66, November 22, 1988, 35 pages. Mathematika, 1989, Vol. 36, (with coauthor A. G. Walton).

Kamowitz, David: *Some observations on boundary conditions for numerical conservation laws.* ICASE Report No. 88-67, November 22, 1988, 13 pages.

Jackson, T. L. and C. E. Grosch: *Effect of heat release on the spatial stability of a supersonic reacting mixing layer.* ICASE Report No. 88-68, November 28, 1988, 12 pages. Proc. Third International Conference on Numerical Combustion, A. Dervieux and B. Larrout, Eds., Springer-Verlag, 1989, pp. 362-373.

Bernardi, Christie, Claudio Canuto, Yvon Maday, Brigitte Metivet: *Single-grid spectral collocation for the Navier-Stokes equations.* ICASE Report No. 88-69, November 28, 1988, 49 pages. IMA J. Numer. Anal, in press 1990.

Saltz, Joel H., Ravi Mirchandaney, and Doug Baxter: *Run-Time parallelization and scheduling of loops.* ICASE Report No. 88-70, January 3, 1989, 34 pages. Excerpts in Proc. of the Third Int. Conf. on Supercomputing, Crete, Greece, June 1989 and in Proceedings of the First Symposium on Parallel Algorithms and Architectures, Santa Fe, NM, 1989.

Rosen, I. G.: *On Hilbert-Schmidt norm convergence of Galerkin approximation for operator Riccati equations.* ICASE Report No. 88-71, November 30, 1988, 18 pages. Proc. of the Fourth International Conference on the Control and Identification of Distributed Parameter Systems, Birkhäuser Verlag, Basel, pp. 335-350.

Cowley, Stephen and Philip Hall: *On the instability of hypersonic flow past a wedge.* ICASE Report No. 88-72, December 8, 1988, 44 pages. J. Fluid Mech., Vol. 214, pp. 17-42, 1990.

Maday, Yvon and Rafael Munoz: *Spectral element multigrid. Part 2: Theoretical justification.* ICASE Report No. 88-73, December 8, 1988, 30 pages. J. Sci. Comput, December 1988, Vol. 3, No. 6, pp. 323-354.

ICASE Reports - 1987

Kamowitz, David: *Multigrid applied to singular perturbation problems.* ICASE Report No. 87-1, January 7, 1987, 27 pages. Applied Mathematics and Computation, Vol. 25, 1988, pp. 145-174.

Jackson, T. L., A. K. Kapila, and D. S. Stewart: *Evolution of a localized thermal explosion in a reactive gas.* ICASE Report No. 87-2, January 8, 1987, 62 pages. SIAM J. Appl. Math., Vol. 49, 1989, pp. 432-458.

Spall, R. E., T. B. Gatski, and C. E. Grosch: *On a criterion for vortex breakdown.* ICASE Report No. 87-3, January 8, 1987, 23 pages. Physics of Fluids, Vol.30, 1987, pp. 3434-3440.

Lohner, Rainald, Ken Morgan, Jaime Peraire, and Mehdi Vahdati: *Finite element flux-corrected transport (FEM-FCT) for the Euler and Navier-Stokes equations.* ICASE Report No. 87-4, January 15, 1987, 25 pages. Internat. J. Numer. Methods Fluids, Vol. 7, 1987, pp. 1093-1109.

Naik, Vijay and Shlomo Ta'asan: *Performance studies of the multigrid algorithms implemented on hypercube multiprocessor systems.* ICASE Report No. 87-5, January 16, 1987, 21 pages. Proc. of the 2nd Hypercube Multiprocessor Conference, 1987, pp. 720-729.

Roe, P. L.: *Error estimates for cell-vertex solutions of the compressible Euler equations.* ICASE Report No. 87-6, January 22, 1987, 42 pages.

Nicol, David and Frank H. Willard: *Problem size, parallel architecture, and optimal speedup.* ICASE Report No. 87-7, April 14, 1987, 30 pages. J. Parallel and Distributed Computing, Vol. 5, No. 4, August 1988, pp. 404-420. appear.

Reneke, J. A. and R. E. Fennell: *RKH space approximations for the feedback operator in a linear hereditary system.* ICASE Report No. 87-8, February 3, 1987, 23 pages.

Hussaini, M. Y.: *Stability, transition, and turbulence.* ICASE Report No. 87-9, February 27, 1987, 20 pages. Proceedings of the NASA Conference on Supercomputing in Aerospace.

Banks, H. T., R. K. Powers, and I. G. Rosen: *Inverse problems in the modeling of vibrations of flexible beams.* ICASE Report No. 87-10, February 27, 1987, 23 pages. *Distributed Parameter Systems,* edited by F. Kappel, et. al., Springer Lecture Notes in Contol and Inf. Science, Vol. 102, 1987, pp. 1-22.

Propst, Georg: *Piecewise linear approximation for hereditary control problems.* ICASE Report No. 87-11, February 27, 1987, 74 pages. SIAM J.Control Optim., January 1990, Vol. 28, No. 1, pp. 70-96.

Keeling, Stephen L.: *On Lipschitz continuity of nonlinear differential operators.* ICASE Report No. 87-12, March 17, 1987, 12 pages. SIAM J. Numer. Anal., April 1990, Vol. 27, No. 2, pp. 385-393.

Keeling, Stephen L.: *Galerkin/Runge-Kutta discretizations for semilinear parabolic equations.* ICASE Report No. 87-13, March 17, 1987, 31 pages. SIAM J. Numer. Anal., April 1990, Vol. 27, No. 2, pp. 394-418.

Tomboulian, Sherryl: *A system for routing arbitrary directed graphs on SIMD architectures.* ICASE Report No. 87-14, March 18, 1987, 24 pages. Submitted to IEEE Trans. Comput.

Brezzi, F.: *A survey of mixed finite element methods.* ICASE Report No. 87-15, March 18, 1987, 32 pages. AMS–World Conference of Mathematics, Berkeley 1986.

Hall, Philip and William D. Lakin: *The fully nonlinear development of Görtler vortices in growing boundary layers.* ICASE Report No. 87-16, March 19, 1987, 35 pages. Proceedings Royal Society London, 1988, Vol. A415, pp. 441-444.

Jackson, T. L. and M. Y. Hussaini: *An asymptotic analysis of supersonic reacting mixing layers.* ICASE Report No. 87-17, March 19, 1987, 16 pages. Combustion Science and Technology, 1988, Vol. 57, pp. 129-140.

Scheurer, B.: *Remarks on the stability analysis of reactive flows.* ICASE Report No. 87-18, March 20, 1987, 21 pages. Proceedings of the NATO Advanced Research Workshop on Mathematical Modeling in Combustion and Related Topics, France, April 27-30, 1987, Claude-Michel Brauner and Claudine Schmidt-Lainé, editors, published by Martinus Nijhoff Publishers, Dordrecht, The Netherlands, pp. 233-242.

Hariharan, S. I. and P. K. Dutt: *Acoustic gravity waves: A computational approach.* ICASE Report No. 87-19, March 24, 1987, 26 pages. Applied Numerical Mathematics., Vol. 57, pp. 129-140.

Erlebacher, G., M. Y. Hussaini, C. G. Speziale, and T. A. Zang: *Toward the large-eddy simulation of compressible turbulent flows.* ICASE Report No. 87-20, March 30, 1987, 38 pages. Updated by ICASE Report No. 90-76.

Keyes, David E. and Mitchell D. Smooke: *Analysis of a parallelized nonlinear elliptic boundary value problem solver with application to reacting flows.* ICASE Report No. 87-21, April 13, 1987, 28 pages. Sixth IMACS International Symposium on Advances in Computer Methods for Partial Differential Equations (Vitchnevetsky and Stepleman, eds.), June 1987, and Proc. of the Symposium on Parallel Computations and Their Impact on Mechanics, American Society of Mechanical Engineers National Meeting, Boston, December 13-18, 1987, A. K. Noor (ed.).

Saltz, Joel: *Automated problem scheduling and reduction of synchronization delay effects.* ICASE Report No. 87-22, July 11, 1987, 37 pages. SIAM J. Sci. Computing, Vol. 11, No. 1, pp. 123-144, January 1990.

Gokhale, Maya: *Exploiting loop level parallelism in nonprocedural dataflow programs.* ICASE Report No. 87-23, April 6, 1987, 19 pages. Proceedings of the International Conference on Parallel Processing, 1987.

Fix, George: *Singular finite element methods.* ICASE Report No. 87-24, April 8, 1987, 32 pages. <u>Advances in Finite Element Methods</u>, D. Dwoyer, et al. (eds.), Springer-Verlag.

Hall, P. and F. T. Smith: *The nonlinear interaction of Tollmien-Schlichting waves and Taylor-Görtler vortices in curved channel flows.* ICASE Report No. 87-25, April 13, 1987, 38 pages. Proc. Roy. Soc. Ser. (A)., Vol. a217, 1988, pp. 255-0282.

Daudpota, Q. Isa, Philip Hall, and Thomas A. Zang: *On the nonlinear interaction of Görtler vortices and Tollmien-Schlichting waves in curved channel flows at finite Reynolds numbers.* ICASE Report No. 87-26, April 21, 1987, 62 pages. J. Fluid Mech., Vol. 193, 1988, pp. 569-595.

Gibson, J. S. and I. G. Rosen: *Approximation of discrete-time LQG compensators for distributed systems with boundary input and unbounded measurement.* ICASE Report No. 87-27, April 24, 1987, 30 pages. Automatica, 1988, Vol. 24, pp. 517-530.

Mac Giolla Mhuiris, Nessan: *Lyapunov exponents for infinite dimensional dynamical systems.* ICASE Report No. 87-28, April 24, 1987, 16 pages. Proceedings of the IMACS Sixth International Conference on Partial Differential Equations.

Swanson, R. C. and Eli Turkel: *Artificial dissipation and central difference schemes for the Euler and Navier-Stokes equations.* ICASE Report No. 87-29, April 29, 1987, 54 pages. Proc. of the AIAA 8th Computational Fluid Dynamics Conference, Hawaii, June 1987, AIAA Paper 87-1107-CP.

Abarbanel, Saul, Pravir Dutt, and David Gottlieb: *Splitting methods for low Mach number Euler and Navier-Stokes equations.* ICASE Report No. 87-30, May 1, 1987, 27 pages. Comp. and Fluids, Vol. 17, No. 1, 1989, pp. 1-12.

Ito, Kazufumi: *Strong convergence and convergence rates of approximating solutions for algebraic Riccati equations in Hilbert spaces.* ICASE Report No. 87-31, May 11, 1987, 20 pages. Distributed Parameter Systems, edited by F. Kappel, K. Kunisch, and W. Schappacher, LNCIS, 102, Springer-Verlag, 1987, pp. 153-166.

Ito, Kazufumi and Robert K. Powers: *Chandrasekhar equations for infinite dimensional systems: Part II. Unbounded input and output case.* ICASE Report No. 87-32, May 11, 1987, 55 pages. J. Differential Equations, 1988, Vol. 75, pp. 371-402.

Shu, Chi-Wang and Stanley Osher: *Efficient implementation of essentially non-oscillatory shock capturing schemes.* ICASE Report No. 87-33, May 11, 1987, 73 pages. J. Comput. Phys., Vol. 77, 1988, p. 439-471.

Fatoohi, Raad A. and Chester E. Grosch: *Solving the Cauchy-Riemann equations on parallel computers.* ICASE Report No. 87-34, May 26, 1987, 37 pages. Appeared as Implementation of a four cell relaxation scheme on the MPP, Flex/32, and CRAY/2, Proc. 1987 Intl. Conf. on Parallel Processing, S. K Sahni, Ed., Penn. State Univ. Press, 1987, pp. 424-426.

Macaraeg, M. G., C. L. Streett, and M. Y. Hussaini: *An analysis of artificial viscosity effects on reacting flows using a spectral multi-domain technique.* ICASE Report No. 87-35, May 26, 1987, 16 pages. Proc. of the 5th International Conference on Numerical Methods in Laminar and Turbulent Flow; also J. Thermdynamics and Heat Transfer, 1989, Vol. 3, No. 1, pp. 13-18.

Maday, Y. and A. Quarteroni: *Error analysis for spectral approximation of the Korteweg-de Vries equation.* ICASE Report No. 87-36, June 8, 1987, 26 pages. M^{2}AN Numerical Analysis, 1988, Vol. 22, No. 3, pp. 499-529.

Naik, Vijay K. and Shlomo Ta'asan: *Implementation of multigrid methods for solving Navier-Stokes equations on a multiprocessor system.* ICASE Report No. 87-37, June 22, 1987, 33 pages. Proc. of the 6th IMACS Int. Symp. on Computer Methods for PDE's, Lehigh University, Pennsylvania, June 23-26, 1987, pp. 389-396.

Pratt, Terrence W.: *The PISCES 2 parallel programming environment.* ICASE Report No. 87-38, July 1, 1987, 15 pages. Proc. 1987 Internat. Conf. on Parallel Processing, August 17-21, 1987, St. Charles, Illinois, Penn State University Press (publisher), pp. 439-445.

Nicol, David and Joel H. Saltz: *Principles for problem aggregation and assignment in medium scale multiprocessors.* ICASE Report No. 87-39, September 18, 1987, 39 pages. Proc. of the 1988 International Conference on Supercomputing, St. Malo, France, July 1988, pp. 140-152.

Ta'asan, Shlomo: *Multigrid methods for bifurcation problems: The self adjoint case.* ICASE Report No. 87-40, July 6, 1987, 36 pages. Revised under the title *Multigrid Methods for Locating Singularities in Bifurcation Problems.* SIAM J. Sci. Statist. Comput., Vol. 11, No. 1, 1990.

Erlebacher, G., S. H. Bokhari, and M. Y. Hussaini: *An efficient parallel algorithm for the simulation of three-dimensional compressible transition on a 20 processor Flex/32 multicomputer.* ICASE Report No. 87-41, July 16, 1987, 19 pages. Appeared under the title *"Parallelization of a Three-Dimensional Compressible Transition Code"* in AIAA Journal, Vol. 28, No. 1, January 1990, pp. 83-90.

Hariharan, S. I. and P. R. Karbhari: *Compressible Navier-Stokes equations: A study of leading edge effects.* ICASE Report No. 87-42, July 17, 1987, 26 pages. Submitted to Mathematical Eng. & Industry.

Fatoohi, Raad A. and Chester E. Grosch: *Implementation of an ADI method on parallel computers.* ICASE Report No. 87-43, July 14, 1987, 26 pages. J. Sci. Comput., Vol. 2, No. 2, 1987, pp. 175-193.

Funaro, D. and D. Gottlieb: *A new method of imposing boundary conditions in pseudospectral approximations of hyperbolic equations.* ICASE Report No. 87-44, July 15, 1987, 30 pages. Math. Comp., Vol. 51, No. 184, 1988, pp. 599-611.

Erlebacher, G., T. A. Zang, and M. Y. Hussaini: *Spectral multigrid methods for the solution of homogeneous turbulence problems.* ICASE Report No. 87-45, July 16, 1987, 21 pages.

Lecture Notes in Pure and Applied Mathematics, Multigrid Methods: Theory, Application and Supercomputing, Vol. 110, pp. 177-194.

Hall, Philip and Mujeeb R. Malik: *The growth of Görtler vortices in compressible boundary layers.* ICASE Report No. 87-46, August 18, 1987, 25 pages. J. Eng. Math., Vol. 23, 1989, p. 239.

Burns, John, Kazufumi Ito, and Georg Propst: *On non-convergence of adjoint semigroups for control systems with delays.* ICASE Report No. 87-47, July 24, 1987, 32 pages. SIAM J. Control Optim., 1988, Vol. 26, pp. 1442-1454.

Maday, Y., A. T. Patera, and E. M. Rønquist: *A well-posed optimal spectral element approximation for the Stokes problem.* ICASE Report No. 87-48, July 28, 1987, 45 pages. To appear in SIAM J. Numer. Anal.

Nicol, David M. and Paul F. Reynolds, Jr.: *Optimal dynamic remapping of parallel computations.* ICASE Report No. 87-49, July 27, 1987, 38 pages. IEEE Trans. Computers, February 1990, Vol. 39, No. 2, pp. 206-219.

Nicol, David M.: *Performance issues for domain-oriented time-driven distributed simulations.* ICASE Report No. 87-50, July 31, 1987. 11 pages. Proc. of the 1987 Winter Simulation Conference, 1987, pp. 624-628.

Nicol, David M.: *Mapping a battlefield simulation onto message-passing parallel architectures.* ICASE Report No. 87-51, October 15, 1987, 17 pages. Proc. of SCS Conference on Distributed Simulation, 1988, pp. 141-146.

Nicol, David M. and Joel H. Saltz: *Optimal pre-scheduling of problem remappings.* ICASE Report No. 87-52, September 18, 1987, 21 pages. Revised under title *Delay Point Schedules for Irregular Parallel Computation* Intl. Journal on Parallel Programming, February 1989, Vol. 18, No. 1, pp. 69-90.

Mavriplis, Dimitri and Antony Jameson: *Multigrid solution of the Euler equations on unstructured and adaptive meshes.* ICASE Report No. 87-53, July 28, 1987, 20 pages. Lecture Notes in Pure and Applied Math., Multigrid Methods - Theory, Applications, and Supercomputing, S. F. McCormick (ed.), Marcel Dekker, Inc., 1988, pp. 413-430.

Tadmor, Eitan: *The convergence of spectral methods for nonlinear conservation laws.* ICASE Report No. 87-54, August 5, 1987, 23 pages. SINUM, Vol. 26, No. 1, 1989, pp. 30-44.

Geer, James and Carl Andersen: *A hybrid perturbation Galerkin technique with applications to slender body theory.* ICASE Report No. 87-55, August 5, 1987, 57 pages. SIAM J. Appl. Math., 1989, Vol. 49, No. 2, pp. 344-361.

Harten, Ami: *ENO schemes with subcell resolution.* ICASE Report No. 87-56, August 19, 1987, 62 pages. UCLA CAM Report 87-13. J. Comp. Phys., 1989, Vol. 83, No. 1, pp. 148-184.

Eiseman, P. R. and G. Erlebacher: *Grid generation for the solution of partial differential equations.* ICASE Report No. 87-57, August 26, 1987, 88 pages. "State-of-the-Art Surveys on Computing Mechanics," Edited by A. K. Noor and J. T. Oden, ASME, NY, 1989, American Society of Mechanical Engineers, Chapter 12, pp. 367-440.

Keeling, Stephen L.: *On implicit Runge-Kutta methods for parallel computations.* ICASE Report No. 87-58, September 2, 1987, 23 pages. Appeared under the title *On the implicit Runge-Kutta methods with a stability function distinct real poles.* KIT, Vol. 29, pp. 91-109.

Wild, Christian: *Analysis and synthesis of abstract data types through generalization from examples.* ICASE Report No. 87-59, September 4, 1987, 24 pages. Submitted to IEEE Trans. Software Engrg. First Annual Hawaii International Conf. System Sciences, Jan. 1988, pp. 21-29, Vol. 2, IEEE Computer Society Press.

Foias, C., O. Manley, and R. Temam: *On the interaction of small and large eddies in two dimensional turbulent flows.* ICASE Report No. 87-60, September 8, 1987, 44 pages.

Keeling, Stephen L.: *Galerkin/Runge-Kutta discretizations for parabolic equations with time dependent coefficients.* ICASE Report No. 87-61, September 9, 1987, 40 pages. Math. Comp., Vol. 52, No. 186, April 1989, pp. 561-586.

Hussaini, M. Y., D. A. Kopriva, and A. T. Patera: *Spectral collocation methods.* ICASE Report No. 87-62, September 10, 1987, 70 pages. Applied Numerical Mathematics, 1989, Vol. 5, pp. 177-208.

Tal-Ezer, Hillel: *Polynomial approximation of functions of matrices and its application to the solution of a general system of linear equations.* ICASE Report No. 87-63, September 11, 1987, 46 pages. J. of Scientific Computing, March 1989, Vol. 4, No. 1, pp. 25-60.

Roe, P. L.: *Discontinuous solutions to hyperbolic systems under operator splitting.* ICASE Report No. 87-64, September 15, 1987, 34 pages. To appear in Numerical Methods for Partial Differential Equations.

Arenstorf, Norbert S. and Harry F. Jordan: *Comparing barrier algorithms.* ICASE Report No. 87-65, September 17, 1987, 39 pages. Parallel Computing, Nov. 1989, Vol. 12, No. 2, pp. 157-170.

Sethian, James A. and Stanley Osher: *Fronts propagating with curvature dependent speed: Algorithms based on Hamilton-Jacobi formulations.* ICASE Report No. 87-66, September 24, 1987, 53 pages. Submitted to J. Comput. Physics., Vol. 99, p. 12-49, 1988.

Bayliss, A., D. Gottlieb, B. J. Matkowsky, and M. Minkoff: *An adaptive pseudo-spectral method for reaction diffusion problems.* ICASE Report No. 87-67, October 1, 1987, 42 pages. J. Comput. Physics, Vol. 81, No. 2, April 1989, pp. 421-443.

LeVeque, Randall J.: *High resolution finite volume methods on arbitrary grids via wave propagation.* ICASE Report No. 87-68, October 21, 1987, 29 pages. J. Comput. Phys., Vol. 78, 1988, pp. 36-63.

Speziale, Charles G.: *On helicity fluctuations and the energy cascade in turbulence*. ICASE Report No. 87-69, November 4, 1987, 11 pages. Lecture Notes in Engineering, Vol. 39, 1989, pp. 50-57.

Bernardi, Christine, Naima Debit, and Yvon Maday: *Coupling finite element and spectral methods: First results*. ICASE Report No. 87-70, January 7, 1988, 31 pages. Math. of Comp., January 1990, Vol. 54, No. 189, pp. 21-41.

Hall, Philip and Sharon MacKerrell: *On the onset of three-dimensionality and time-dependence in the Görtler vortex problem*. ICASE Report No. 87-71, November 5, 1987, 38 pages. J. Fluid Mech., Vol. 204, 1989, p. 405.

Sunahara, Y. and F. Kojima: *A new method of boundary parameter estimation for a two-dimensional diffusion system under noisy observations*. ICASE Report No. 87-72, November 10, 1987, 27 pages. Proc. of the 10th IFAC World Congress on Automatic Control, Munich, FRG, Pergamon Press, 1988.

Speziale, C. G., G. Erlebacher, T. A. Zang, and M. Y. Hussaini: *On the subgrid-scale modeling of compressible turbulence*. ICASE Report No. 87-73, December 7, 1987, 13 pages. Physics of Fluids., Vol. 31, 1988, pp. 940-942.

Speziale, C. G. and Tuan Ngo: *Numerical solution of turbulent flow past a backward facing step using a nonlinear K-ε model*. ICASE Report No. 87-74, December 7, 1987, 45 pages. Int. J. Engng. Sci., Vol. 26, No. 10, 1988, pp. 1099-1112.

Alaghband, Gita: *Parallel pivoting combined with parallel reduction*. ICASE Report No. 87-75, December 8, 1987, 40 pages. Parallel Computing Journal, November 1989, pp. 201-221.

ICASE Reports: 1986

Canuto, C. and Q. Quarteroni: *On the boundary treatment in spectral methods for hyperbolic systems*. ICASE Report No. 86-1, December 27, 1985, 19 pages. J. Comput. Phys., Vol. 71, No. 1, July 1987.

Gottlieb, D., L. Lustman, and E. Tadmor: *Stability analysis of spectral methods for hyperbolic initial-boundary value systems*. ICASE Report No. 86-2, January 16, 1986, 38 pages. SIAM J. Numer. Anal., Vol. 24, No. 2, April 1987, pp. 241-256.

Dutt, P.: *A Riemann solver based on a global existence proof for the Riemann problem*. ICASE Report No. 86-3, January 17, 1986, 12 pages. Submitted to J. Comput. Phys. but withdrawn.

Saltz, Joel H., Vijay Naik, and David M. Nicol: *Reduction of the effects of the communication delays in scientific algorithms on message passing MIMD architectures*. ICASE Report No.

<u>86-4</u>, January 22, 1986, 26 pages. SIAM J. Sci. Stat. Comput., Vol. 8, No. 1, January 1987, pp. 118-134.

Moitra, A., E. Turkel, and A. Kumar: *Application of a Runge-Kutta scheme for high-speed inviscid internal flows.* ICASE Report No. 86-5, January 31, 1986, 26 pages. AIAA Paper No. 86-0104. AIAA 24th Aerospace Sciences Meeting, January 6-9, 1986, Reno, Nevada.

Eidson, T. M., M. Y. Hussaini, and T. A. Zang: *Simulation of the turbulent Rayleigh-Benard problem using a spectral/finite difference technique.* ICASE Report No. 86-6, February 4, 1986, 43 pages. Proc. EUROMECH 199 Direct and Large Eddy Simulation of Turbulent Flows, Munich, Germany, September 30 - October 2, 1985.

Nicol, David M. and Paul F. Reynolds, Jr.: *An optimal repartitioning decision policy.* ICASE Report No. 86-7, February 10, 1986, 19 pages. IEEE Trans. on Software Engineering, withdrawn.

Gottlieb, D., L. Lustman, and E. Tadmor: *Convergence of spectral methods for hyperbolic initial-boundary value systems.* ICASE Report No. 86-8, January 17, 1986, 15 pages. SIAM J. Numer. Anal., Vol. 24, No. 3, pp. 532-537.

Abarbanel, S., A. Bayliss, and L. Lustman: *Non-reflecting boundary conditions for the compressible Navier-Stokes equations.* ICASE Report No. 86-9, March 4, 1986, 26 pages. Invited lecture at the 7th Internat. Conference on Computing Methods in Applied Science and Engineering, December 9-13, 1985, Versailles, France (INRIA). Volume of Proceedings, North-Holland (1986).

Hariharan, S. I.: *Nonlinear acoustic wave propagation in atmosphere.* ICASE Report No. 86-10, March 5, 1986, 28 pages. IMACS Proceedings on Computational Acoustics, August 1986, Yale and Algorithms and Applications, D. Lee, R. L. Sternberg, and M. Schultz, North-Holland, Vol. 2, 1988, pp. 65-82..

Banks, H. T. and K. A. Murphy: *Quantitative modeling of growth and dispersal in population models.* ICASE Report No. 86-11, March 17, 1986, 13 pages, Proc. Intl. Symposium on Mathematical Biology, November 10-15, 1985, Japan, Springer LN in Biomath, Vol. 71, 1987, pp. 98-109.

Lakin, W. D.: *A combined integrating and differentiating matrix formulation for boundary value problems on rectangular domains.* ICASE Report No. 86-12, March 17, 1986, 30 pages. J. Engrg. Math., Vol. 20, 1986, pp. 203-215.

Iqbal, M. Ashraf, Joel H. Saltz, and Shahid H. Bokhari: *Performance tradeoffs in static and dynamic load balancing strategies.* ICASE Report No. 86-13, March 17, 1986, 24 pages. Proc. of the 1986 Internat. Conf. on Parallel Processing, August 1986, pp. 1040-1047.

Turkel, E.: *Preconditioned methods for solving the incompressible and low speed compressible equations.* ICASE Report No. 86-14. March 20, 1986, 38 pages. J. Comp. Phys., Vol. 72, 1987, pp. 277-298.

Gibson, J. S. and I. G. Rosen: *Numerical approximation for the infinite-dimensional discrete-time optimal linear-quadratic regulator problem.* ICASE Report No. 86-15, March 20, 1986, 82 pages. SIAM J. Cont. Opt., Vol. 26, No. 2, pp. 428-451, March 1988.

Gibson, J. S. and I. G. Rosen: *Shifting the closed-loop spectrum in the optimal linear quadratic regulator problem for hereditary systems.* ICASE Report No. 86-16, March 20, 1986, 47 pages. IEEE Trans. Auto. J. Control, Vol. AC-32, No. 9, September 1986, pp. 831-836.

Shih, Ke-Gang: *On the existence of solutions for an equation arising in the theory of laminar flow in a uniformly porous channel with injection.* ICASE Report No. 86-17, March 21, 1986, 26 pages. SIAM J. Appl. Math., Vol. 47, No. 3, 1987, pp. 526-533.

South, J. C., Jr. and M. Y. Hussaini, (eds.): *Advances in numerical and applied mathematics.* ICASE Report No. 86-18, March 28, 1986, 597 pages. Applied Numerical Mathematics, Vol. 2, No. 3-5, 1986, pp. 161-437.

Lee, Tai-yong, Costas Kravaris, and John H. Seinfeld: *History matching by spline approximation and regularization in single-phase areal reservoirs.* ICASE Report No. 86-19, March 31, 1986, 53 pages. SPE Reservoir Engineering, September 1986, pp. 521-534.

Mac Giolla Mhuiris, Nessan: *The construction and use of divergence free vector expansions for incompressible fluid flow calculations.* ICASE Report No. 86-20, April 15, 1986, 21 pages. Proceedings of a Spectral Methods Workshop, Roger Temam (ed.)..

Bayliss, A., K. E. Jordan, B. J. LeMesurier, and E. Turkel: *A fourth order accurate finite difference scheme for the computation of elastic waves.* ICASE Report No. 86-21, April 23, 1986, 44 pages. Bulletin of the Seismological Society of America, Vol. 76, No. 4, August 1986, pp. 1115-1132.

Harten, Ami, Bjorn Engquist, Stanley Osher, and Sukumar R. Chakravarthy: *Uniformly high order accurate essentially non-oscillatory schemes III.* ICASE Report No. 86-22, April 29, 1986, 97 pages. J. Comput. Phys., Vol. 71, No. 2, 1987, pp. 231-303.

Ta'asan, Shlomo: *Multigrid method for the equilibrium equations of elasticity using a compact scheme.* ICASE Report No. 86-23, April 30, 1986, 25 pages. J. Comp. Physics, Vol. 75, No. 2, 1987, pp. 432-446.

Reed, Daniel A., Loyce M. Adams, and Merrell L. Patrick: *Stencils and problem partitionings: Their influence on the performance of multiple processor systems.* ICASE Report No. 86-24, May 2, 1986, 47 pages. IEEE Trans. Comput., Vol. C-36, No. 7, July 1987, pp. 845-858.

Hussaini, M. Y. and T. A. Zang: *Spectral methods in fluid dynamics.* ICASE Report No. 86-25, May 5, 1986, 61 pages. Annual Review of Fluid Mechanics, Vol. 19, 1987.

Hussaini, M. Y., W. D. Lakin, and A. Nachman: *On similarity of a boundary layer problem with an upstream moving wall.* ICASE Report No. 86-26, May 9, 1986, 25 pages. SIAM J. Appl. Math., Vol. 47, No. 4, August 1987, pp. 699-709.

Chen, T. F. and G. J. Fix: *Least squares finite element simulation of transonic flows.* ICASE Report No. 86-27, May 9, 1986, 47 pages. Applied Numerical Mathematics, Vol. 2, 1986, pp. 221-241.

Kopriva, David: *A spectral multidomain method for the solution of hyperbolic systems.* ICASE Report No. 86-28, May 9, 1986, 47 pages. Applied Numerical Mathematics, Vol. 2, 1986, pp. 221-241.

Ta'asan, Shlomo: *Multigrid method for a vortex breakdown simulation.* ICASE Report No. 86-29, May 9, 1986, 22 pages. Applied Numerical Mathematics, Vol. 2, 1986, pp. 303-311.

Gunzburger, M. D. and R. A. Nicolaides: *On structuring algorithms and solution techniques for the numerical approximation of partial differential equations.* ICASE Report No. 86-30, May 9, 1986, 32 pages. Applied Numerical Mathematics, Vol. 2, 1986, pp. 243-256.

Strikwerda, J. C., B. A. Wade, and K. P. Bube: *Regularity estimates up to the boundary for elliptic systems of difference equations.* ICASE Report No. 86-31, May 8, 1986, 65 pages. SIAM J. Numer. Anal., Vol. 27, No. 2, pp. 292-322, April 1990.

Burns, J. A., E. M. Cliff, and R. K. Powers: *Computational methods for the control of distributed parameter systems.* ICASE Report No. 86-32, May 12, 1986, 18 pages. Proc. of the 24th IEEE Conf. on Decision and Control, December 1986, pp. 1994-1998.

Tadmor, Eitan: *A minimum entropy principle in the gas dynamics equations.* ICASE Report No. 86-33, May 20, 1986, 20 pages. Applied Numerical Mathematics, Vol. 2, 1986, pp. 211-219.

Mac Giolla Mhuiris, Nessan: *Calculations of the stability of some axisymmetric flows proposed as a model of vortex breakdown.* ICASE Report No. 86-34, May 20, 1986, 36 pages. Applied Numerical Mathematics, Vol. 2, 1986, pp. 273-290.

Speziale, Charles G.: *On the advantages of the vorticity-velocity formulation of the equations of fluid dynamics.* ICASE Report No. 86-35, May 20, 1986, 10 pages. J. Comp. Phys., Vol. 73, No. 2, December 1987, pp. 476-480.

South, Jerry C., Jr., Mohammed M. Hafez, and David Gottlieb: *Stability analysis of intermediate boundary conditions in approximate factorization schemes.* ICASE Report No. 86-36, May 20, 1986, 27 pages. Applied Numerical Mathematics, Vol. 2, 1986.

Swanson, R. C. and E. Turkel: *Pseudo-time algorithms for the Navier-Stokes equations.* ICASE Report No. 86-37, May 21, 1986, 32 pages. Applied Numerical Mathematics, Vol. 2, 1986, pp. 321-334.

Banks, H. T. and D. W. Iles: *On compactness of admissible parameter sets: Convergence and stability in inverse problems for distributed parameter systems.* ICASE Report No. 86-38, June 9, 1986, 16 pages. Proc. Conf. on Control Systems Governed by PDE's (Feb. 3-6, 1986, Gainesville, FL), Springer Lecture Notes in Control & Inf. Science, Vol. 97, 1987, pp. 130-142.

Erlebacher, Gordon and Yousuff Hussaini: *Incipient transition phenomena in compressible flows over a flat plate.* ICASE Report No. 86-39, June 10, 1986, 21 pages. Proc. 10th Inter. Conf. on Numer. Methods in Fluid Dynamics, June 1986, pp. 264-269.

Iqbal, M. Ashraf: *Approximate algorithms for partitioning and assignment problems.* ICASE Report No. 86-40, June 10, 1986, 16 pages. Submitted to IEEE Trans. Computers.

Bokhari, Shahid: *Multiprocessing the sieve of Eratosthenes.* ICASE Report No. 86-41, June 17, 1986, 26 pages. IEEE Computer, Vol. 20, No. 4, 1987, pp. 50-58.

Nicolaides, R. A.: *Construction of higher order accurate vortex and particle methods.* ICASE Report No. 86-42, June 13, 1986, 20 pages. Applied Numerical Mathematics, 1987, Vol. 2, p. 421.

Lamm, Patricia K. and Katherine A. Murphy: *Estimation of discontinuous coefficients and boundary parameters for hyperbolic systems.* ICASE Report No. 86-43, June 18, 1986, 39 pages. To appear in Quart. Appl. Math.

Goldberg, Moshe and Eitan Tadmor: *Convenient stability criteria for difference approximations of hyperbolic initial-boundary value problems II.* ICASE Report No. 86-44, June 25, 1986, 38 pages. Math. Comp., Vol. 48, 1987, pp. 503-520.

Nicol, David M. and Joel H. Saltz: *Dynamic remapping of parallel computations with varying resource demands.* ICASE Report No. 86-45, July 18, 1986, 55 pages. IEEE Trans. Comput., Vol. 37, No. 9, September 1988, pp. 1073-1087.

Saltz, Joel H. and David M. Nicol: *Statistical methodologies for the control of dynamic remapping.* ICASE Report No. 86-46, July 8, 1986, 33 pages. Statistical Methodologies for the Control of Dynamic Remapping, In Parallel Processing and Medium Scale Multiprocessors, Ed. Arthur Wouk, SIAM publications, 1989, pp. 35-57.

Poore, Aubrey B.: *The expanded Langrangian system for constrained optimization problems.* ICASE Report No. 86-47, July 9, 1986, 29 pages. SIAM J. Control Optim., Vol. 26, No. 2, March 1988.

Maestrello, Lucio, Alvin Bayliss, Paresh Parikh, and Eli Turkel: *Stability and control of compressible flows over a surface with concave-convex curvature.* ICASE Report No. 86-48, July 9, 1986, 34 pages.

Rosenfeld, M., M. Israeli, and M. Wolfshtein: *A numerical study of separation on a spheroid at incidence.* ICASE Report No. 86-49, July 11, 1986, 35 pages. AIAA Journal, February 1988, Vol. 26, No. 2.

Sidi, Avram and Moshe Israeli: *Numerical quadrature methods for integrals of singular periodic functions and their application to singular and weakly singular integral equations.* ICASE Report No. 86-50, July 16, 1986, 35 pages. Submitted to SIAM J. Numer. Anal.

Lustman, Liviu R. and Milton E. Rose: *A three dimensional calculation of elastic equilibrium for composite materials.* ICASE Report No. 86-51, July 24, 1986, 28 pages. To appear in Internat. J. Numer. Methods Engrg., Vol. 26, 1988, pp. 953-971.

Hariharan, S. I. and S. I. Sudharsanan: *Wave envelope technique for multimode wave guide problems.* ICASE Report No. 86-52, July 30, 1986, 29 pages. J. Sci. Comput., Vol. 2, No. 4, 1987, pp. 371-387.

Nicol, David M.: *Optimal partitioning of random programs across two processors.* ICASE Report No. 86-53, August 1, 1986, 26 pages. IEEE Trans. Software Engrg., Feb. 1989, Vol. 15, No. 2, pp. 134-141.

Jordan, Harry F.: *The force on the Flex: Global parallelism and portability.* ICASE Report No. 86-54, August 5, 1986, 21 pages. Parallel Processing and Medium Scale Multiprocessors, Arthur Wouk (ed.), SIAM, Philadelphia, 1989, Chapter 9, pp. 157-176.

Nicol, David M.: *Expected performance of m-solution backtracking.* ICASE Report No. 86-55, August 5, 1986, 25 pages. SIAM J. Comput., Vol. 17, No. 1, February 1988., pp. 114-127.

Jackson, T. L.: *Effect of thermal expansion on the stability of two-reactant flames.* ICASE Report No. 86-56, August 18, 1986, 13 pages. Combustion Science Technology, Vol. 53, 1987, pp. 51-54.

Hussaini, M. Y.: *Recent developments in spectral methods.* ICASE Report No. 86-57, August 29, 1986, 19 pages. Proc. 10th Inter. Conf. Numer. Meth. in Fluid Dynamics, Springer-Verlag, F. G. Zhuang and Y. L. Zhu (eds.), pp. 18-29.

Nicol, David M. and Paul F. Reynolds: *Dynamic remapping decisions in multiphase parallel computations.* ICASE Report No. 86-58, September 8, 1986, 47 pages. IEEE Trans. Comput., withdrawn.

Streett, C. L. and M. Y. Hussaini: *Finite length effects in Taylor-Couette flow.* ICASE Report No. 86-59, September 9, 1986, 30 pages. Proc. Workshop on the Stability of Time-Dependent/Spatially Varying Flows, Springer-Verlag, D. Dwoyer and M. Y. Hussaini (eds.), pp. 312-330.

Solomonoff, A. and E. Turkel: *Global collocation methods for approximation and the solution of partial differential equations.* ICASE Report No. 86-60, September 17, 1986, 67 pages. J. Comput. Physics. Revised under the title *Global Properties of Pseudospectral Methods*, Vol. 81, 1989, pp.239-276.

Bernardi, Christine, Claudio Canuto, and Yvon Maday: *Generalized inf-sup condition for Chebyshev approximation of the Navier-Stokes equations.* ICASE Report No. 86-61, November 7, 1986, 67 pages. Part 1 SIAM J. Numer. Anal., December 1988, Vol. 25, No. 6, pp.

1237-1271. Part 2 has been included in ICASE Report No. 88-69 and IMA J. of Numerical Analysis, in press 1990.

Gunzburger, M. D.: *Mathematical aspects of finite element methods for incompressible viscous flows.* ICASE Report No. 86-62, September 18, 1986, 46 pages. Proceedings of the ICASE Workshop Held July 28-30, 1986, in Hampton, Virginia, Springer-Verlag, Edited by D. L. Dwoyer, M. Y. Hussaini, and R. G. Voigt, pp. 124-150.

LeVeque, Randall J. and Lloyd N. Trefethen: *Fourier analysis of the SOR iteration.* ICASE Report No. 86-63, September 30, 1986, 9 pages. IMA J. Numer. Anal., 1988, Vol. 8, pp. 273-279.

Dutt, Pravir and Shlomo Ta'asan: *A spline-based parameter estimation technique for static models of elastic structures.* ICASE Report No. 86-64, October 8, 1986, 33 pages. Applied Numer. Math., Vol. 5, No. 3, 1989, pp. 161-175.

Ta'asan, Shlomo and Pravir Dutt: *Parameter estimation problem for distributed systems using a multigrid method.* ICASE Report No. 86-65, October 8, 1986, 19 pages. Quart. Appl. Math., Vol. XLVIII, No. 2, June 1990.

Myers, Thomas J. and Maya B. Gokhale: *Parallel scheduling of recursively defined arrays.* ICASE Report No. 86-66, October 3, 1986, 26 pages. J. Sym. Comp., June 1988.

Gokhale, Maya B: *PS: A nonprocedural language with data types and modules.* ICASE Report No. 86-67, October 3, 1986, 20 pages. Fall Joint Computer Conference, 1987, under the title *Algorithm Specification in a Very High Level Language.*

Napolitano, M. and J. H. Morrison: *Efficient solutions of two-dimensional incompressible steady viscous flows.* ICASE Report No. 86-68, October 16, 1986, 46 pages. Comput. and Fluids, Vol. 16, No. 2, 1988, pp. 119-132.

Harten, A.: *On the nonlinearity of modern shock-capturing schemes.* ICASE Report No. 86-69, October 17, 1986, 62 pages. In "Wave Motion: Theory, Modelling, and Computation," Proceedings of a Conference in Honor of the 60th Birthday of Peter Lax, A. J. Chorin and A. J. Majda, editors, Mathematical Sciences Research Institute Publications, Springer-Verlag, 1987, pp. 147-201.

Banks, H. T. and I. G. Rosen *Computational methods for the identification of spatially varying stiffness and damping in beams.* ICASE Report No. 86-70, October 22, 1986, 42 pages. Control: Theory and Advanced Technology, Vol. 3, 1987, pp. 1-32.

Banks, H. T., S. S. Gates, I. G. Rosen, and Y. Wang: *The identification of a distributed parameter model for a flexible structure.* ICASE Report No. 86-71, October 22, 1986, 43 pages. SIAM J. Control and Optim., 1988, Vol. 26, pp. 743-762.

Gibson, J. S. and I. G. Rosen: *Computational methods for optimal linear-quadratic compensators for infinite dimensional discrete-time systems.* ICASE Report No. 86-72, October 22,

1986, 25 pages. Proc. of the Conf. on the Control and Identification of Distributed Parameter Systems, Vorau, Austria, Springer-Verlag, Franz Koppel, et al. (eds.).

Bennett, J. and P. Hall: *On the secondary instability of Taylor-Görtler vortices to Tollmien-Schlichting waves in fully-developed flows.* ICASE Report No. 86-73, November 17, 1986, 46 pages. J. Fluid Mech., Vol. 186, pp. 445-469.

Tadmor, E.: *Convenient total variation diminishing conditions for nonlinear difference schemes.* ICASE Report No. 86-74, November 18, 1986, 32 pages. SINUM, Vol. 25, No. 5, October 1988, pp. 1002-1014.

Roe, P. L.: *Remote boundary conditions for unsteady multidimensional aerodynamic computations.* ICASE Report No. 86-75, November 18, 1986, 26 pages. Computers and Fluids, Vol. 17, pp. 221-231, 1989.

Banks, H. T. and K. Ito: *A numerical algorithm for optimal feedback gains in high dimensional LQR problems.* ICASE Report No. 86-76, November 18, 1986, 31 pages. Submitted to SIAM J. Control Optim.

Temam, Roger: *Survey of the status of finite element methods for partial differential equations.* ICASE Report No. 86-77, November 18, 1986, 63 pages. Proc. of the Finite Element Workshop at Hampton, Virginia, Springer-Verlag.

Nicolaides, R. A. and Shenaz Choudhury: *Iterative methods for elliptic finite element equations on general meshes.* ICASE Report No. 86-78, November 25, 1986. Proc. of the Finite Element Workshop at Hampton, Virginia, Springer-Verlag.

Ma, C. C. H.: *Inherent stability robustness of adaptive control systems.* ICASE Report No. 86-79, November 14, 1986, 39 pages. Control Theory and Advanced Technology, Vol. 3, No. 3, September 1987, pp. 197-216.

Brenier, Yann and Stanley Osher: *The discrete one-sided Lipschitz condition for convex scalar conservation laws.* ICASE Report No. 86-80, November 25, 1986, 33 pages. SIAM J. Numer. Anal., 1988, Vol. 25, pp. 8-23.

Adams, Loyce, Randy LeVeque, and David Young: *Analysis of the SOR iteration for the 9-point Laplacian.* ICASE Report No. 86-81, December 8, 1986, 40 pages. SIAM J. Numer. Anal., Vol. 25, 1988, pp. 1156-1180.

Kopriva, David A.: *A practical assessment of spectral accuracy for hyperbolic problems with discontinuities.* ICASE Report No. 86-82, December 9, 1986, 22 pages. J. Sci. Comp., Vol. 2, 1987, pp. 249-261.

Hall, Philip: *The nonlinear development of Görtler vortices in growing boundary layers.* ICASE Report No. 86-83, December 9, 1986, 52 pages. J. Fluid Mech., Vol. 193, 1988, pp. 243-266.

ICASE Reports: 1985

Ortega, J. M. and R. G. Voigt: *Solution of partial differential equations on vector and parallel computers.* ICASE Report No. 85-1, January 2, 1985, 173 pages. SIAM Review, Vol. 27, No. 2, June 1985, pp. 149-240.

Voigt, R. G.: *Where are the parallel algorithms?* ICASE Report No. 85-2, January 16, 1985, 14 pages. 1985 National Computer Conference Proceedings, AFIPS Press, Reston, VA, pp. 329-334.

Gottlieb, D. and E. Tadmor: *Recovering pointwise values of discontinuous data within spectral accuracy.* ICASE Report No. 85-3, January 31, 1985, 20 pages. Progress and Supercomputing in Computational Fluid Dynamics, E. M. Murman and S. S. Abarbanel (eds.), Birkhauser Boston, Inc., 1985, pp. 357-375.

Noonan, R. E.: *An algorithm for generating abstract syntax trees.* ICASE Report No. 85-4, January 31, 1985, 18 pages. Computer Languages, Vol. 10, No. 3-4, 1985, pp. 225-236.

Lakin, W.: *Differentiating matrices for arbitrarily spaced grid points.* ICASE Report No. 85-5, January 31, 1985, 23 pages. Internat. J. Numer. Methods Engrg., Vol. 23, 1986, pp. 209-218.

Fleming, P. J.: *SUBOPT - A CAD program for suboptimal linear regulators.* ICASE Report No. 85-6, February 4, 1985, 16 pages. Proc. Institute of Measurement and Control Workshop on Computer-Aided Control Workshop on Computer-Aided Control System Design, Brighton, England, September 1984, pp. 13-20.

Banks, H. T. and I. G. Rosen: *A Galerkin method for the estimation of parameters in hybrid systems governing the vibration of flexible beams with tip bodies.* ICASE Report No. 85-7, February 5, 1985, 44 pages, CSDL Report R-1724, June 1984, Charles Stark Draper Laboratories, Cambridge, MA.

Tal-Ezer, H.: *The eigenvalues of the pseudospectral Fourier approximation to the operator* $sin(2x)\frac{\partial}{\partial x}$. ICASE Report No. 85-8, February 7, 1985, 10 pages.

Tal-Ezer, H.: *Spectral methods in time for parabolic problems.* ICASE Report No. 85-9, February 8, 1985, 19 pages. SIAM J. Numer. Anal., February 1989, Vol. 26, No. 1.

Tadmor, E.: *Complex symmetric matrices with strongly stable iterates.* ICASE Report No. 85-10, February 14, 1985, 1985, 22 pages. Linear Algebra and Appl., Vol. 78, 1986, pp. 65-77.

Turkel, E.: *Algorithms for the Euler and Navier-Stokes equations for supercomputers.* ICASE Report No. 85-11, February 14, 1985, 27 pages. Progress and Supercomputing in Computational Fluid Dynamics, E. M. Murman and S. S. Abarbanel (eds.), Birkhauser Boston, Inc., 1985, pp. 155-172.

Pratt, T. W.: *PISCES: An environment for parallel scientific computation.* ICASE Report No. 85-12, February 15, 1985, 30 pages. IEEE Trans. Software Engrg., Vol. 2, No. 4, July 1985, pp. 7-20.

Harabetian, E.: *A convergent series expansion for hyperbolic systems of conservation laws.* ICASE Report No. 85-13, February 20, 1985, 88 pages. Trans. Amer. Math. Soc., Vol. 294, No. 2, April 1986, pp. 383-425.

Abarbanel, S. and D. Gottlieb: *Information content in spectral calculations.* ICASE Report No. 85-14, February 21, 1985, 13 pages. Progress and Supercomputing in Computational Fluid Dynamics, E. M. Murman and S. S. Abarbanel (eds.), Birkhauser Boston, Inc., 1985, pp. 345-356.

Cox, C. L. and G. J. Fix: *On the accuracy of least squares methods in presence of corner singularities.* ICASE Report No. 85-15, February 21, 1985, 24 pages. Comput. Math. Math. Appl., Vol. 10, No. 6, 1985, pp. 463-475.

Noonan, R. E. and W. R. Collins: *Construction of a menu-based system.* ICASE Report No. 85-16, February 26, 1985, 11 pages. Submitted to Software Practice and Experience but withdrawn.

Maday, Y.: *Analysis of spectral operators in one-dimensional domains.* ICASE Report No. 85-17, February 28, 1985, 26 pages. Math. Comp., in press 1990.

Roe, P. L.: *Discrete models for the numerical analysis of time-dependent multidimensional gas dynamics.* ICASE Report No. 85-18, March 1, 1985, 36 pages. J. Comput. Phys., Vol. 63, No. 2, April 1986, pp. 458-476.

Zang, T. A. and M. Y. Hussaini, and T. A. Zang: *Spectral methods for modeling supersonic chemically reacting flow fields.* ICASE Report No. 85-19, March 6, 1985, 39 pages. AIAA Paper No. 85-0296, presented at the AIAA 23rd Aerospace Sciences Meeting, January 14-17, 1985, Reno, Nevada.

Drummond, J. P., M. Y. Hussaini, and T. A. Zang: *Spectral methods for modeling supersonic chemically reacting flow fields.* ICASE Report No. 85-20, March 8, 1985, 37 pages. AIAA J., Vol. 24, 1986, pp. 1461-1467.

LeVeque, R. J.: *Intermediate boundary conditions for LOD, ADI, and approximate factorization methods.* ICASE Report No. 85-21, April 17, 1985, 24 pages.

Rosen, I. G.: *Spline-based Rayleigh-Ritz methods for the approximation of the natural modes of vibration for flexible beams with tip bodies.* ICASE Report No. 85-22, March 18, 1985, 31 pages. Quarterly of Applied Mathematics, Vol. XLIV, No. 1, April 1986, pp. 169-185.

Bayliss, A., L. Maestrello, P. Parikh, and E. Turkel: *Numerical simulation of boundary layer excitation by surface heating/cooling.* ICASE Report No. 85-23, March 25, 1985, 22

pages. AIAA Paper No. 85-0565, AIAA Shear Flow Control Conference, March 12-14, 1985, Boulder, Colorado. AIAA J., Vol. 24, 1986, pp. 1095-1101.

Hossain, M., G. Vahala and D. Montgomery: *Forced MHD turbulence in a uniform external magnetic field* ICASE Report No. 85-24, March 28, 1985, 39 pages. Phys. Fluids, Vol. 28, No. 10, 1985, pp. 3074-3081.

Davis, S. F.: *Shock capturing.* ICASE Report No. 85-25, April 26, 1985, 23 pages. To appear in Numerical Methods for Partial Differential Equations, S. I. Hariharan and T. H. Moulden (eds.), Pitman Press, 1986.

Brandt, A. and S. Ta'asan: *Multigrid solutions to quasi-elliptic schemes.* ICASE Report No. 85-26, May 10, 1985, 21 pages. Progress and Supercomputing in Computational Fluid Dynamics, E. M. Murman and S. Abarbanel (eds.), Birkhauser Boston, Inc., 1985, pp. 235-255.

Zang, T. A. and M. Y. Hussaini: *On spectral multigrid methods for the time-dependent Navier-Stokes equations.* ICASE Report No. 85-27, May 13, 1985, 24 pages. Presented at the 2nd Copper Mountain Conference on Multigrid Methods, April 1-3, 1985, Copper Mountain, Colorado. Applied Mathematics and Computation.

Osher, S. and E. Tadmor: *On the convergence of difference approximations to scalar conservation laws.* ICASE Report No. 85-28, May 14, 1985, 70 pages. Math. Comp., Vol. 50, 1988, pp. 19-51.

Mehrotra, P. and J. Van Rosendale: *The BLAZE language: A parallel language for scientific programming.* ICASE Report No. 85-29, May 15, 1985, 57 pages. Parallel Computing, Vol. 5, 1987, pp. 339-361.

Trefethen, L. N. and L. Halpern: *Well-posedness of one-way wave equations and absorbing boundary conditions.* ICASE Report No. 85-30, June 10, 1985, 23 pages. Math. Comp., Vol. 47, 1986, pp. 421-435.

Majda, G.: *A new theory for multistep discretizations of stiff ordinary differential equations: Stability with large step sizes.* ICASE Report No. 85-31. June 11, 1985, 70 pages. Math. Comp., Vol. 47, No. 176, October 1986, pp. 473-502.

Banks, H. T.: *On a variational approach to some parameter estimation problems.* ICASE Report No. 85-32, June 18, 1985, 38 pages. Invited lecture, International Conference on Control Theory for Distributed Parameter Systems and Applications, July 9-14, 1984, Vorau, Austria.

Hariharan, S. I.: *Absorbing boundary conditions for exterior problems.* ICASE Report No. 85-33, July 16, 1985, 33 pages. Numerical Methods for Partial Differential Equations, S. I. Hariharan and T. H. Moulden (eds.), Pitman Press, 1986.

Rosenau, P. and E. Turkel: *Long-time asymptotics of a system for plasma diffusion.* ICASE Report No. 85-34, July 23, 1985, 18 pages. Transport Theory and Statistical Physics, Vol. 16, 1987, pp. 377-392.

Adams, L.: *Reordering computations for parallel execution.* ICASE Report No. 85-35, July 24, 1985, 18 pages. Comm. Appl. Numer. Meths., Vol. 2, No. 3, May-June 1986, pp. 263-272.

Noonan, R. E. and W. R. Collins: *The parser generator as a general purpose tool.* ICASE Report No. 85-36, July 31, 1985, 35 pages. Submitted to Computing Surveys but withdrawn.

Dutt, P.: *Stable boundary conditions and difference schemes for Navier-Stokes equations.* ICASE Report No. 85-37, August 1, 1985, 86 pages. To appear in SIAM J. Numer. Anal.

Abarbanel, S., D. Gottlieb, and E. Tadmor: *Spectral methods for discontinuous problems.* ICASE Report No. 85-38, August 9, 1985, 30 pages. In "Numerical Methods for Fluid Dynamics - II" Proc. of Conference on Numerical Methods for Fluid Dynamics, (K. W. Morton and M. J. Baines, ed.), Reading, England, 1985, Oxford Univ. Press, 1986, pp. 129-153.

Saltz, J. H. and V. K. Naik: *Towards developing robust algorithms for solving partial differential equations on MIMD machines.* ICASE Report No. 85-39, August 10, 1985, 51 pages. Parallel Computing, Vol. 6, No. 1, (1987).

Hall, P.: *An asymptotic investigation of the stationary modes of instability of the boundary layer on a rotating disc.* ICASE Report No. 85-40, August 10, 1985, 29 pages. Proc. Roy. Soc. (A), Vol. 406, 1986, pp. 93-106.

Shih, K.-G. and S. S. Antman: *Qualitative properties of large buckled states of spherical shells.* ICASE Report No. 85-41, September 12, 1985, 71 pages. Arch. Rational Mech. Anal., Vol. 93, No. 4, 1986, pp. 357-384.

Brewer, D. W. and J. S. Gibson: *Parameter identification for a robotic manipulator arm.* ICASE Report No. 85-42, September 18, 1985, 24 pages. Conference paper updated by ICASE Report No. 88-1.

Turkel, E.: *Accuracy ·f schemes with nonuniform meshes for compressible fluid flows.* ICASE Report No. 85-43, September 23, 1985, 48 pages. Appl. Numer. Math., Vol. 2, 1986, pp. 529-550.

Bayliss, A., P. Parikh, L. Maestrello, and E. Turkel: *A fourth-order scheme for the unsteady compressible Navier-Stokes equations.* ICASE Report No. 85-44, October 2, 1985, 24 pages. AIAA Paper No. 85-1694.

Jordan, H. F.: *Parallel computation with the force.* ICASE Report No. 85-45, October 4, 1985, 12 pages. Part of this paper appeared in *The Characteristics of Parallel Algorithms* under the title *The Force*, edited by L. H. Jameson, B. B. Gannon, R. J. Douglass, Chapter 16, MIT Press in 1987.

Jordan, H. F. and G. Alaghband: *Multiprocessor sparse L/U decomposition with controlled fill-in.* ICASE Report No. 85-48, October 18, 1985, 38 pages. Revised under the title *Gaussian Elimination*, IEEE Trans. Comput., November 1989, Vol. 38, No. 11, pp. 1539-1557.

Speziale, C. G.: *Second-order closure models for rotating turbulent flows*. ICASE Report No. 85-49, October 21, 1985, 24 pages. Quart. Appl. Math., Volume XLV, No. 4, December 1987, pp. 721-733.

Kreiss, G. and H.-O. Kreiss: *Convergence to steady state of solutions of Burgers' equation*. ICASE Report No. 85-50, December 10, 1985, 30 pages. Applied Numerical Mathematics (Issue in honor of Milt Rose).

Tadmor, E.: *The numerical viscosity of entropy stable schemes for systems of conservation laws, I*. ICASE Report No. 85-51, November 8, 1985, 30 pages. Math. Comp., Vol. 49, 1987, pp. 91-103.

Maestrello, L., P. Parikh, A. Bayliss, and E. Turkel: *Active control of compressible flows on a curved surface*. ICASE Report No. 85-52, November 14, 1985, 28 pages. SAE Aerospace Technology Paper, SAE Technical Paper Series, No. 851856.

Harabetian, E.: *Matched asymptotic expansions to similarity solutions of shock diffraction*. ICASE Report No. 85-53, November 18, 1985, 32 pages. Appeared under the title *The fraction of a weak shock by a wedge* in Comm. Pure Applied Math., 1987, Vol. XL(150), pp. 849-2863.

Bokhari, S. H.: *Partitioning problems in parallel, pipelined, and distributed computing*. ICASE Report No. 85-54, November 19, 1985, 34 pages. IEEE Trans. Comput., Vol. C-37, No. 1, January 1988, pp. 48-57.

Berger, M. J. and S. H. Bokhari: *A partitioning strategy for non-uniform problems on multiprocessors*. ICASE Report No. 85-55, November 20, 1985, 29 pages. IEEE Trans. Comput., C-36, No. 5, May 1987, pp. 570-580.

Bayliss, A., L. Maestrello, P. Parikh, and E. Turkel: *Wave phenomena in a high Reynolds number compressible boundary layer*. ICASE Report No. 85-56, November 20, 1985, 25 pages. Stability of Time-Dependent and Spatially Varying Flows, D. L. Dwoyer and M. Y. Hussaini (eds.), Springer-Verlag, 1985, pp. 188-205.

Brandt, A. and S. Ta'asan: *Multigrid method for nearly singular and slightly indefinite problems*. ICASE Report No. 85-57, November 21, 1985, 34 pages. Lecture Notes in Mathematics, W. Hackbusch and U. Trottenberg (eds.), Springer-Verlag, 1986.

Burns, J. A. and R. K. Powers: *Factorization and reduction methods for optimal control of distributed parameter systems*. ICASE Report No. 85-58, November 22, 1985, 102 pages. Mathematica Applicada e Computacional, Vol. 5, No. 3, 1987, pp. 203-248. Revised under the title *Factorization and reduction methods for optimal control of hereditary systems*.

Turkel, E., S. Yaniv, and U. Landau: *Accuracy of schemes for the Euler equations with non-uniform meshes*. ICASE Report No. 85-59, December 5, 1985, 21 pages. AIAA Paper No. 86-0341.

Israeli, M.: *Marching iterative methods for the parabolized and thin layer Navier-Stokes equations.* ICASE Report No. 85-60, December 5, 1985, 26 pages. Proc. of Bi-national US/Israel Workshop on "Impact of Supercomputers on the Next Decade of Computational Fluid Dynamics," Jerusalem, December 1984.

Grosch, C. E.: *Adapting a Navier-Stokes code to the ICL-DAP.* ICASE Report No. 85-61, December 1985, SIAM J. Sci. Stat. Comput., Vol. 8, 1987, pp. s96-s117.

ICASE Reports: 1984

Adams, L. M. and T. W. Crockett: *Modelling algorithm execution time on processor arrays.* ICASE Report No. 84-1, January 16, 1984, 22 pages. IEEE Computer, Vol. 17, No. 7, July 1984, pp. 38-44.

Phillips, T. N. and M. E. Rose: *A finite difference scheme for the equilibrium equations of elastic bodies.* ICASE Report No. 84-2, January 24, 1984, 31 pages. SIAM J. Sci. Stat. Comput., Vol. 7, No. 1, January 1986, pp. 288-300.

Hussaini, M. Y., D. A. Kopriva, M. D. Salas, and T. A. Zang: *Spectral methods for the Euler equations: Fourier methods and shock-capturing.* ICASE Report No. 84-4, January 27, 1984, 31 pages. AIAA J., Vol. 23, No. 2, January 1985, pp. 234-313.

Hall, P., M. R. Malik, and D. I. A. Poll: *On the stability of an infinite swept attachment line boundary layer.* ICASE Report No. 84-5, February 7, 1984, 44 pages. Proc. Roy. Soc. London (A), Vol. 395, 1985, p. 229.

Sritharan, S. S.: *Delta wings with shock-free cross flow.* ICASE Report No. 84-6, February 6, 1984, 25 pages. Quart. Appl. Math., Vol. 43, No. 3, October 1985, pp. 275-286.

Lamm, P. Daniel: *Estimation of discontinuous coefficients in parabolic systems: Applications to reservoir simulation.* ICASE Report No. 84-7, February 13, 1984, 54 pages. SIAM J. Control Optim., Vol. 25, January 1987, pp. 18-37.

Tal-Ezer, H.: *Spectral methods in time for hyperbolic equations.* ICASE Report No. 84-8, February 15, 1984, 33 pages. SIAM J. Numer. Anal., Vol. 23, No. 1, February 1986, pp. 11-26.

Wong, Y. S.: *Newton like - minimal residual methods applied to transonic flow calculations.* ICASE Report No. 84-9, February 15, 1984, 32 pages. AIAA J., Vol. 23, No. 4, April 1985, pp. 515-521.

Osher, S.: *Convergence of generalized MUSCL schemes.* ICASE Report No. 84-10, February 16, 1984, 36 pages. SIAM J. Numer. Anal., Vol. 22, 1985, pp. 947-961.

Trefethen, L. N.: *Stability of finite difference models containing two boundaries or interfaces.* ICASE Report No. 84-11, March 18, 1984, 46 pages. Math. Comp., Vol. 45, No. 172, pp. 279-648.

Sritharan, S. S. and P. W. Smith: *On the grid generation methods by harmonic mapping on plane and curved surfaces.* ICASE Report No. 84-12, March 19, 1984, 22 pages. Complex Variables, Gordon and Breach Science Publishers, Inc., Vol. 10, 1988, pp. 359-369.

Ito, K.: *An iterative method for indefinite systems of linear equations.* ICASE Report No. 84-13, April 2, 1984, 21 pages. Submitted to SIAM J. Numer. Anal.

Adams, L. M. and H. F. Jordan: *Is SOR color-blind?* ICASE Report No. 84-14, May 21, 1984, 39 pages. SIAM J. Sci. Statist. Comput., Vol. 7, No. 2, April 1986, pp. 490-506.

Gatski, T. B. and C. E. Grosch: *A numerical study of the two- and three-dimensional unsteady Navier-Stokes equations in velocity-vorticity variables using compact difference schemes.* ICASE Report No. 84-15, May 22, 1984, 20 pages. Lecture Notes in Physics, No. 218, Soub baramayer and J. P. Boujot (eds.), Springer-Verlag, 1984, Proc. of 9th Intl. Conference on Numerical Methods in Fluid Dynamics, Saclay, France, pp. 235-239.

Hall, P.: *The Görtler vortex instability mechanism in three-dimensional boundary layers.* ICASE Report No. 84-17, June 6, 1984, 37 pages. Roy. Soc. London (A), Vol. 399, p. 135.

Gonzani, J., A. Nachson, and E. Turkel: *Conjugate gradient coupled with multigrid for an indefinite problems.* ICASE Report No. 84-18, June 7, 1984, 11 pages. Advances in Computer Methods for Partial Differential Equations V, 1984, pp. 425-427.

Malik, M. R., T. A. Zang, and M. Y. Hussaini: *A spectral collocation method for the Navier-Stokes equations.* ICASE Report No. 84-19, June 8, 1984, 48 pages. J. Comput. Phys., Vol. 61, No. 1, October 1985, pp. 64-88.

Davis, S. F.: *TVD finite difference schemes and artificial viscosity.* ICASE Report No. 84-20, June 11, 1984, 35 pages. SIAM J. Sci. Statis. Comput., Vol. 8, No. 1, January 1987. Revised under the title *A simplified TVD finite difference scheme via artificial viscosity.*

Canuto, C., S. I. Hariharan, and L. Lustman: *Spectral methods for exterior elliptic problems.* ICASE Report No. 84-21, June 12, 1984, 33 pages. Numer. Math., Vol. 46, 1985, pp. 505-520.

Graif, E. and K. Kunisch: *Parameter estimation for the Euler-Bernoulli-beam.* ICASE Report No. 84-22, June 20, 1984, 42 pages. Matematica Aplicada Computacional, Vol. 4, No. 2, 1985, pp. 95-124.

Rosen, I. G.: *A numerical scheme for the identification of hybrid systems describing the vibration of flexible beams with tip bodies.* ICASE Report No. 84-23, June 21, 1984, 36 pages. J. Math. Anal. Appl., Vol. 116, No. 1, May 1986, pp. 262-288.

Banks, H. T. and K. A. Murphy: *Estimation of coefficients and boundary parameters in hyperbolic systems.* ICASE Report No. 84-24, June 21, 1984, 52 pages. SIAM J. Control Optim., 1986, Vol. 24, pp. 926-950.

Vardi, A.: *A new minmax algorithm.* ICASE Report No. 84-25, June 21, 1984, 35 pages. Submitted to J. Optim. Theory and Applications.

Banks, H. T. and I. G. Rosen: *Approximation techniques for parameter estimation and feedback control for distributed models of large flexible structures.* ICASE Report No. 84-26, June 21, 1984, 19 pages. Proc. Workshop on Identification and Control of Flexible Space Structures, San Diego, CA, June 4-6, 1984, G. Rodriguez (ed.).

Turkel, E. and B. van Leer: *Flux vector splitting and Runge-Kutta methods for the Euler equations.* ICASE Report No. 84-27, June 23, 1984, 9 pages. Lecture Notes in Physics, No. 218, Soubbaramayer and J. P. Boujot (eds.), Springer-Verlag, 1984, Proc. of 9th Intl. Conference on Numerical Methods in Fluid Dynamics, Saclay, France, pp. 566-570.

Turkel, E.: *Fast solutions to the steady compressible and incompressible fluid dynamic equations.* ICASE Report No. 84-28, June 23, 1984, 8 pages. Lecture Notes in Physics, No. 218, Soubbaramayer and J. P. Boujot (eds.), Springer-Verlag, 1984, Proc. of 9th Intl. Conference on Numerical Methods in Fluid Dynamics, Saclay, France, pp. 571-575.

Gottlieb, D.: *Spectral methods for compressible flow problems.* ICASE Report No. 84-29, June 22, 1984, 20 pages. Lecture Notes in Physics, No. 218, Soubbaramayer and J. P. Boujot (eds.), Springer-Verlag, 1984, Proc. of 9th Intl. Conference on Numerical Methods in Fluid Dynamics, Saclay, France, pp. 48-61.

Ipsen, I. C. F.: *Singular value decomposition with systolic arrays.* ICASE Report No. 84-30, July 6, 1984, 22 pages. Proc. of the Society of Photo-Optical Engineers, Bellingham, Washington, July 9, 1984.

Ito, K. and R. Teglas: *Legendre-tau approximation for functional differential equations, Part II: The linear quadratic optimal control problem.* ICASE Report No. 84-31, July 6, 1984, 65 pages. SIAM J. Control Optim., 1987, Vol. 25, pp. 1379-1408.

Turkel, E.: *Acceleration to a steady state for the Euler equations.* ICASE Report No. 84-32, July 7, 1984, 45 pages. Proc. INRIA Euler Workshop (SIAM), Rocquencourt, France, December 7-9, 1983, Numer. Meths. for the Euler Equations of Fluid Dynamics, F. Angrand, et al. (eds.), SIAM, 1985, pp. 281-311.

Bokhari, S. H. and A. D. Raza: *Augmenting computer networks.* ICASE Report No. 84-33, July 8, 1984, 16 pages. Appeared under the title *Reducing the Diameters of Computer Networks* in IEEE Trans. Comput., Vol. C-35, No. 8, August 1986, pp. 757-761.

Reed, D. A. and M. L. Patrick: *A model of asynchronous iterative algorithms for solving large, sparse, linear systems.* ICASE Report No. 84-34, July 31, 1984, 27 pages. Proc. 1984

Intl. Conference on Parallel Processing, IEEE computer Society Press, Robert M. Keller (ed.), 1984, pp. 402-409.

Reed, D. A. and M. L. Patrick: *Parallel, iterative solution of sparse linear systems: Models and architectures*. ICASE Report No. 84-35, August 1, 1984, 45 pages. Parallel Computing, Vol. 2, 1985, pp. 45-67.

Tadmor, E.: *The well-posedness of the Kuramoto-Sivashinsky equation*. ICASE Report No. 84-36, August 7, 1984, 22 pages. SIAM J. Math. Anal., Vol. 17, 1986, pp. 884-893.

Lustman, L.: *The time evolution of spectral discretizations of hyperbolic systems*. ICASE Report No. 84-37, August 7, 1984, 12 pages. SIAM J. Numer. Anal., Vol. 23, No. 6, December 1986.

Bayliss, A., C. I. Goldstein, and E. Turkel: *On accuracy conditions for the numerical computation of waves*. ICASE Report No. 84-38, August 9, 1984, 16 pages. J. Comput. Phys., Vol. 59, No. 3, July 1985, pp. 396-404.

Hariharan, S. I.: *Numerical solutions of acoustic wave propagation problems using Euler computations*. ICASE Report No. 84-39, August 10, 1984, 29 pages. Proc. of the AIAA 9th Aeroacoustics Conference, Williamsburg, VA, August 15-17, 1984, AIAA Paper No. 84-2290.

Tadmor, E.: *The exponential accuracy of Fourier and Tchebyshev differencing methods*. ICASE Report No. 84-40, August 20, 1984, 24 pages. SIAM J. Numer. Anal., Vol. 23, 1986, pp. 1-10.

Gannon, D. and J. Van Rosendale: *On the impact of communication complexity in the design of parallel numerical algorithms*. ICASE Report No. 84-41, August 22, 1984, 37 pages. IEEE Trans. on Computers, Vol. C-33, No. 12, December 1984, pp. 1180-1194.

Ito, K.: *Legendre-Tau approximation for functional differential equations, Part III: Eigenvalue approximations and uniform stability*. ICASE Report No. 84-42, August 24, 1984, 34 pages. Proc. Second International Conference on Control Theory for Distributed Parameter Systems and Applications, Vorau, Austria, 1984.

Berger, M. J.: *On conservation at grid interfaces*. ICASE Report No. 84-43, September 7, 1984, 25 pages. SIAM J. Numer. Anal., Vol. 24, October 1987, pp. 967-984.

Osher, S. and S. Chakravarthy: *Very high order accurate TVD schemes*. ICASE Report No. 84-44, September 10, 1984, 61 pages. Math. and Its Applications, Vol. 2, 1986, pp. 229-274.

Elcrat, A. R. and L. N. Trefethen: *Classical free-streamline flow over a polygonal obstacle*. ICASE Report No. 84-45, September 10, 1984, 61 pages. J. Comput. Appl. Math., Vol. 14, 1986, pp. 251-265.

Krause, E.: *Review of some vortex relations*. ICASE Report No. 84-46, September 12, 1984, 8 pages. Computer and Fluids, Vol. 13, No. 4, 1984, pp. 513-515.

Leuze, M.: *Parallel triangularization of substructured finite element problems.* ICASE Report No. 84-47, September 13, 1984, 18 pages. Linear Algebra Appl., Vol. 77, 1986, pp. 241-258.

Tal-Ezer, H.: *A pseudospectral Legendre method for hyperbolic equations with an improved stability condition.* ICASE Report No. 84-48, September 14, 1984, 46 pages. J. Comput. Phys., Vol. 67, No. 1, November 1986, pp. 145-172.

Bayliss, A., C. I. Goldstein, and E. Turkel: *The numerical solution of the Helmholtz equation for wave propagation problems in underwater acoustics.* ICASE Report No. 84-49, September 17, 1984, 29 pages. J. Comput. and Math. Appl., Vol. 11, 1985, pp. 655-665.

Burns, J. A., K. Ito, and R. K. Powers: *Chandrasekhar equations and computational algorithms for distributed parameter systems.* ICASE Report No. 84-50, September 20, 1984, 23 pages. Proc. 23rd Conference on Decision and Control, Vol. 1, IEEE Control Systems Society, 1984, pp. 262-267.

Rosen, I. G.: *Approximation methods for inverse problems involving the vibration of beams with tip bodies.* ICASE Report No. 84-51, September 26, 1984, 10 pages. Proc. 23rd IEEE Conference on Decisions and Control, Vol. 3, IEEE Control Systems Society, 1984, pp. 1692-1694.

Canuto, C.: *Boundary conditions in Chebyshev and Legendre methods.* ICASE Report No. 84-52, October 1, 1984, 38 pages. SIAM J. Numer. Anal., Vol. 23, 1986, pp. 815-831.

Roe, P. L.: *Generalized formulation of TVD Lax-Wendroff schemes.* ICASE Report No. 84-53, October 23, 1984, 14 pages.

Bokhari, Shahid H.: *Shuffle-exchanges on augmented meshes.* ICASE Report No. 84-54, October 24, 1984, 12 pages. First International Conf. on Supercomputing Systems, St. Petersburg, Florida, IEEE Computer Society, December 16-20, 1985., pp. 613-617.

Goodman, J. B. and R. J. LeVeque: *A geometric approach to high resolution TVD schemes.* ICASE Report No. 84-55, October 29, 1984, 35 pages. SIAM J. Numer. Anal., Vol. 25, 1988, pp. 268-284.

Wong, Tin-Chi, C. H. Liu, and J. Geer: *Comparison of uniform perturbation solutions and numerical solutions for some potential flows past slender bodies.* ICASE Report No. 84-56, October 29, 1984, 32 pages. Computers and Fluids. Vol. 13, No. 3, 1985, pp. 271-283.

Salas, M. D., S. Abarbanel, and D. Gottlieb: *Multiple steady states for characteristic initial value problems.* ICASE Report No. 84-57, November 1, 1984, 43 pages. Applied Numer. Math., Vol. 2, Nos. 3-5, October 1986, pp. 193-210.

Rose, Milton E.: *A compact finite element method for elastic bodies.* ICASE Report No. 84-58, November 7, 1984, 38 pages. Numer. Meth. for PDE, Vol. 3, 1985, pp. 209-228.

Lustman, L.: *A review of spectral methods.* ICASE Report No. 84-59, November 19, 1984, 25 pages. Lecture Series, Numerical Methods for Partial Differential Equations at University of Tennessee Space Institute, Short Course, January 1985.

Hussaini, M. Y. and W. D. Lakin: *Existence and non-uniqueness of similarity solutions of a boundary layer problem.* ICASE Report No. 84-60, November 21, 1984, 17 pages. Quart. J. Mech. Appl. Math., Vol. 39, 1986, pp. 15-24.

Bayliss, A., L. Maestrello, and E. Turkel: *On the interaction of a sound pulse with the shear layer of an axisymmetric jet, III. Nonlinear effects.* ICASE Report No. 84-61, November 23, 1984, 22 pages. J. Sound Vibration, 1986, Vol. 107, No. 1, 1986, pp. 167-175.

Swanson, R. C. and E. Turkel: *A multistage time-stepping scheme for the Navier-Stokes equations.* ICASE Report No. 84-62, November 23, 1984, 28 pages. AIAA 23rd Aerospace Science Meeting, January 14-17, 1985, Reno, Nevada, 1985, AIAA Paper No. 85-0035.

Brenier, Y. and S. Osher: *Approximate Riemann solvers and numerical flux functions.* ICASE Report No. 84-63, December 5, 1984, 33 pages. SIAM J. Numer. Anal., Vol. 23, 1986, pp. 259-273.

Hall, P. and M. R. Malik: *On the stability of a three-dimensional attachment line boundary layer: Weakly nonlinear theory and a numerical approach.* ICASE Report No. 84-64, December 6, 1984, 65 pages. J. Fluid Mech., Vol. 163, 1986, pp. 256-282.

Fix, G. J. and M. Suri: *Three-dimensional mass conserving elements for compressible flows.* ICASE Report No. 84-65, December 13, 1984, 27 pages. Comput. Math. Appl., Vol. 11, No. 7, 1985, pp. 765-776.

Banks, H. T. and J. M. Crowley: *Methods for the identification of material parameters in distributed models for flexible structures.* ICASE Report No. 84-66, December 28, 1984, 45 pages. Matematica Aplicada e Comput., Vol. 5, 1986, pp. 139-168.

Ito, K. and R. K. Powers: *Chandrasekhar equations for infinite dimensional systems.* ICASE Report No. 84-67, December 31, 1984, 36 pages. SIAM J. Control Optim., 1987, Vol. 25, pp. 596-611.

ICASE Reports: 1983

Phillips, T. N.: *Numerical solution of a coupled pair of elliptic equations from solid state electronics.* ICASE Report No. 83-1, January 12, 1983, 18 pages. J. Comput. Phys., Vol. 53, No. 3, March 1984, pp. 472-483.

Phillips, T. N.: *Natural convection in an enclosed cavity.* ICASE Report No. 83-2, February 24, 1983, 24 pages. J. Comput. Phys., Vol. 54, No. 3, June 1984, pp. 365-381.

Dahlburg, R. B., T. A. Zang, D. C. Montgomery, and M. Y. Hussaini: *Viscous, resistive MHD stability computed by spectral techniques.* ICASE Report No. 83-3, March 1, 1983, 28 pages. Proc. Nat. Acad. Sci., Vol. 80, September 1983, pp. 5798-5802.

Fix, G. J. and M. E. Rose: *A comparative study of finite element and finite difference methods for Cauchy-Riemann type equations.* ICASE Report No. 83-4, March 28, 1983, 22 pages. SIAM J. Numer. Anal., Vol. 22, No. 2, April 1985, pp. 250-261.

Dunn, M. H. and S. I. Hariharan: *Numerical computations on one-dimensional inverse scattering problems.* ICASE Report No. 83-5, April 13, 1983, 15 pages. J. Comput. Phys., Vol. 55, No. 1, July 1984, pp. 157-165.

Flaherty, J. E. and R. E. O'Malley, Jr.: *Numerical methods for stiff systems of two-point boundary value problems.* ICASE Report No. 83-6, April 7, 1983, 43 pages. SIAM J. Sci. Statist. Comput., Vol. 5, No. 4, December 1984, pp. 865-886.

Chen, G. and Q. Zheng: *N-person differential games part I: Duality-finite element methods.* ICASE Report No. 83-7, April 14, 1983, 67 pages. Proc. of the Royal Society of Edinburgh, Vol. 103A, 1986, pp. 15-34.

Chen, G., W. H. Mills, Q. Zheng, and W. Shaw: *N-person differential games part II: The penalty method.* ICASE Report No. 83-8, April 15, 1983, 52 pages. Submitted to SIAM J. Control Optim.

Adams, L. M.: *M-step preconditioned conjugate gradient method.* ICASE Report No. 83-9, April 16, 1983, 29 pages. SIAM J. Sci. and Statist. Comput., Vol. 6, No. 2, April 1985.

Zang, T. A., M. Y. Hussaini, and D. M. Bushnell: *Numerical computations of turbulence amplification in shock wave interaction.* ICASE Report No. 83-10, April 28, 1983, 33 pages. AIAA J., Vol. 22, No. 1, January 1984, pp. 13-21.

Streett, C. L., T. A. Zang, and M. Y. Hussaini: *Spectral multigrid methods with applications to transonic potential flow.* ICASE Report No. 83-11, April 29, 1983, 53 pages. J. Comput. Phys., Vol. 57, No. 1, January 1985, pp. 43-76.

Zang, T. A., Y. S. Wong, and M. Y. Hussaini: *Spectral multigrid methods for elliptic equations II.* ICASE Report No. 83-12, May 3, 1983, 32 pages. J. Comput. Phys., Vol. 54, No. 3, June 1984, pp. 489-507.

Banks, H. T. and J. M. Crowley: *Parameter identification in continuum models.* ICASE Report No. 83-13, May 4, 1983, 5 pages. Proc. of 1983 American Control Conference, San Francisco, CA, June 22-24, 1983, published by IEEE.

Zang, T. A., D. A. Kopriva, and M. Y. Hussaini: *Pseudospectral calculation of shock turbulence interactions.* ICASE Report No. 83-14, May 16, 1983, 11 pages. Proc. of Numerical Methods Conference, C. Taylor, J. A. Johnson, W. R. Smith (eds.), Pineridge Press, Swansea, United Kingdom, 1984, pp. 210-221.

Tadmor, E.: *The large-time behavior of the scalar, genuinely nonlinear Lax-Friedrichs scheme.* ICASE Report No. 83-15, June 13, 1983, 30 pages. Math. Comp., Vol. 43, No. 168, October 1984, pp. 353-368.

Tadmor, E.: *Entropy functions for symmetric systems of conservation laws.* ICASE Report No. 83-16, June 14, 1983, 7 pages. J. Math. Anal. and Appl., Vol. 122, 1987, pp. 355-359.

Ito, K. and R. G. Teglas: *Legendre-Tau approximations for functional differential equations.* ICASE Report No. 83-17, June 14, 1983, 43 pages. SIAM J. Control Optim., Vol. 24, 1986, pp. 737-759.

Teglas, R. G.: *On the control canonical structure of a class of scalar input systems.* ICASE Report No. 83-18, June 14, 1983, 36 pages. Replaces ICASE Report No. 81-40. SIAM J. Control Optim., Vol. 22, No. 4, July 1984, pp. 552-569.

Banks, H. T. and G. Majda: *Modeling of flexible surfaces: A preliminary study.* ICASE Report No. 83-19, June 14, 1983, 23 pages. Math. Modeling, Vol. 5, 1984, pp. 103-115.

Tadmor, E.: *Numerical viscosity and the entropy condition for conservative difference schemes.* ICASE Report No. 83-20, June 14, 1983, 26 pages. Math. Comp., Vol. 43, No. 168, October 1984, pp. 369-381.

Sritharan, S. S. and A. R. Seebass: *Finite area method for nonlinear supersonic conical flows.* ICASE Report No. 83-21, June 15, 1983, 34 pages. AIAA J., Vol. 22, February 1984, pp. 226-233.

Tadmor, E.: *Finite-difference, spectral and Galerkin methods for time-dependent problems.* ICASE Report No. 83-22, June 15, 1983, 53 pages. Revised under the title *Stability analysis of finite-difference, pseudospectral, and Fourier-Galerkin approximations for time-dependent problems.* SIAM Rev., Vol. 29, 1987, pp. 525-555.

Adams, L. M.: *An M-step preconditioned conjugate gradient method for parallel computation.* ICASE Report No. 83-23, June 15, 1983, 8 pages. SIAM J. Sci. Statist. Comput., Vol. 6, No. 2, April 1985, pp. 452-463.

Fleming, P. J.: *CAD of control systems: Application of nonlinear programming to a linear-quadratic formulation.* ICASE Report No. 83-24, June 22, 1983, 7 pages. Proc. of IFAC Workshop on Applications of Nonlinear Programming to Optimization and Control, June 20-21, 1983, Pergamon Press, pp. 9-15.

Banks, H. T., P. L. Daniel, and E. S. Armstrong: *A spline-based parameter and state estimation technique for static models of elastic surfaces.* ICASE Report No. 83-25, June 28, 1983, 61 pages, NASA/ACC Workshop on Identification and Control of Flexible Space Structures, June 4-6, 1984, San Diego, CA, JPL, Vol. 3, 1985, 263-282.

Phillips, T. N. and M. E. Rose: *A compact finite difference scheme for $div(\rho grad u) - q^2 u = 0$.* ICASE Report No. 83-26, June 29, 1983, 20 pages. Revised under the title *A finite difference scheme for a class of first-order elliptic partial differential equations.* Intl. J. Comput. Math. Appl., Vol. 11, 1985, pp. 411-417.

Phillips, T. N.: *A preconditioned formulation of the Cauchy-Riemann equations*. ICASE Report No. 83-27, June 29, 1983, 13 pages. Revised under the title *An embedding method for the Cauchy-Riemann equation*. IMA J. Numer. Anal., Vol. 5, 1985, pp. 429-436.

Canuto, C. and A. Quarteroni: *Preconditioned minimal residual methods for Chebyshev spectral calculations*. ICASE Report No. 83-28, June 29, 1983, 31 pages. J. Comput. Phys., Vol. 60, No. 2, September 15, 1985, pp. 315-337.

Van Rosendale, J. R.: *Algorithms and data structures for adaptive multigrid elliptic solvers*. ICASE Report No. 83-29, June 29, 1983, 31 pages. Appl. Math. Comput., Vol. 13, Nos. 3 and 4, 1983, pp. 453-470.

Dadfar, B. M., J. F. Geer, and C. M. Andersen: *Perturbation analysis of the limit cycle of the free van der Pol equation*. ICASE Report No. 83-30, June 29, 1983, 31 pages. SIAM J. Appl. Math., Vol. 44, No. 5, October 1984, pp. 881-895.

Hussaini, M. Y., M. D. Salas, and T. A. Zang: *Spectral methods for inviscid, compressible flows*. ICASE Report No. 83-31, July 14, 1983, 39 pages. Advances in Computational Transonics, W. G. Habashi (ed.), Pineridge Press, Swansea, United Kingdom, 1985.

Hariharan, S. I. and A. Bayliss: *Radiation of sound from unflanged cylindrical ducts*. ICASE Report No. 83-32, July 14, 1983, 28 pages. SIAM J. Sci. Statist. Comput., Vol. 6, No. 2, April 1985, pp. 285-296.

Adams, L. M. and R. G. Voigt: *A methodology for exploiting parallelism in the finite element process*. ICASE Report No. 83-33, September 9, 1983, 36 pages. NATO ASI Series, Vol. F7, J. Kowalik (ed.), Proc. of NATO Advanced Research Workshop on High Speed Computation, Julich, West Germany, June 1983.

Banks, H. T. and K. Kunisch: *The linear regulator problem for parabolic systems*. ICASE Report No. 83-34, July 24, 1983, 28 pages. SIAM J. Control Optim., Vol. 22, No. 5, September 1984, pp. 684-698.

LeVeque, R. J. and L. N. Trefethen: *On the resolvent condition in the Kreiss matrix theorem*. ICASE Report No. 83-35, July 24, 1983, 12 pages. BIT, January 1984, Vol. 24, pp. 584-591.

Van Rosendale, J. R.: *Minimizing inner product data dependencies in conjugate gradient iteration*. ICASE Report No. 83-36, July 24, 1983, 10 pages. Proc. of the IEEE International Conference on Parallel Processing, August 23-26, 1983, H. J. Siegel and Leah Siegel (eds.), IEEE Computer Society Press, pp. 44-46.

Davis, S. F.: *A rotationally biased upwind difference scheme for the Euler equations*. ICASE Report No. 83-37, July 24, 1983, 50 pages. J. Comput. Phys., Vol. 56, No. 1, October 1984, pp. 65-92.

van Leer, B.: *Computational methods for ideal compressible flow*. ICASE Report No. 83-38, July 25, 1983, 32 pages. Lecture Notes for Lecture Series 1983-04 on Computational Fluid Dynamics, Von Karman Institute for Fluid Dynamics, Rhode-St-Genese, Belgium, 1983.

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Gannon, D. B. and J. R. Van Rosendale: *Parallel architectures for iterative methods on adaptive, block structured grids.* ICASE Report No. 83-39, August 15, 1983, 14 pages. Elliptic Problem Solvers II, G. Birkhoff and A. Schoenstadt (eds.), Academic Press, 1984, pp. 93-104.

Daniel, P. L.: *An approximation technique for estimating discontinuous coefficients in distributed systems.* ICASE Report No. 83-40, August 15, 1983, 12 pages. Proc. of Inverse Scattering: Theory and Application Conference, 1983, J. B. Bednar, R. Redner, E. Robinson, and A. Weglein (eds.), SIAM, Philadelphia, Pennsylvania, pp. 194-205, (published under the name Patricia Daniel Lamm).

Pratt, T. W., L. M. Adams, P. Mehrotra, J. R. Van Rosendale, R. G. Voigt, and M. L. Patrick: *The FEM-2 design method.* ICASE Report No. 83-41, August 15, 1983, 10 pages. Proc. of IEEE International Conference on Parallel Processing, August 23-26, 1983, H. J. Siegel and L. Siegel (eds.), IEEE Computer Society Press, pp. 132-134.

Berger, M. J.: *Stability of interfaces with mesh refinement.* ICASE Report No. 83-42, August 24, 1983, 24 pages. Math. Comp., Vol. 45, No. 172, October 1985, pp. 301-318.

Hariharan, S. I. and R. C. MacCamy: *Low frequency acoustic and electromagnetic scattering.* ICASE Report No. 83-43, August 25, 1983, 26 pages. IMACS, Numerical Solutions of Singular Integral Equations, A. Gerasoulis and R. Vichnevetsky (eds.), 1984, pp. 43-50.

Gunzburger, M. D., R. A. Nicolaides, and C. H. Liu: *Low discretization and solution techniques for incompressible viscous flow problems.* ICASE Report No. 83-44, August 26, 1983, 21 pages. Proc. of AIAA 6th Computational Fluid Dynamics Conference, Danvers, MA, July 13-15, 1983, pp. 665-671.

Hall, P.: *On the stability of the unsteady boundary layer on a cylinder oscillating transversely in a viscous fluid.* ICASE Report No. 83-45, August 26, 1983, 43 pages. J. Fluid Mech., Vol. 146, p. 347.

Hussaini, M. Y., C. L. Streett, and T. A. Zang: *Spectral methods for partial differential equations.* ICASE Report No. 83-46, August 29, 1983, 62 pages. Proc. of First Army Conference on Applied Mathematics and Computing, Washington, DC, May 9-11, 1983, pp. 883-925.

Giles, M. B.: *Eigenmode analysis of unsteady one-dimensional Euler equations.* ICASE Report No. 83-47, August 29, 1983, 16 pages.

Phillips, T. N., T. A. Zang, and M. Y. Hussaini: *Preconditioners for the spectral multigrid method.* ICASE Report No. 83-48, September 2, 1983, 31 pages. IMA J. Numer. Anal., 1986.

Osher, S. and S. Chakravarthy: *High resolution schemes and the entropy condition.* ICASE Report No. 83-49, September 7, 1983, 62 pages. SIAM J. Numer. Anal., Vol. 21, No. 5, October 1984, pp. 955-984.

Goldberg, M. and E. Tadmor: *Convenient stability criteria for difference approximations of hyperbolic initial-boundary value problems.* ICASE Report No. 83-50, September 19, 1983, 28 pages. Math. Comp., Vol. 44, No. 170, April 1985, pp. 361-377.

Kopriva, D. A., T. A. Zang, M. D. Salas, and M. Y. Hussaini: *Pseudospectral solution of two-dimensional gas-dynamic problems.* ICASE Report No. 83-51, September 23, 1983, 15 pages. Proc. 5th GAMM Conference on Numerical Methods in Fluid Dynamics, M. Pandolfi and R. Piva (eds.), Frider Viewag & Sohn, Braunschweig, Wiesbaden, pp. 185-192.

Giles, M. B. and M. E. Rose: *A numerical study of the steady scalar convective diffusion equation for small viscosity.* ICASE Report No. 83-52, September 27, 1983, 28 pages. J. Comp. Phys., Vol. 56, No. 3, December 1984, pp. 513-529.

Banks, H. T., K. Ito, and K. A. Murphy: *Computational methods for estimation of parameters in hyperbolic systems.* ICASE Report No. 83-53, September 28, 1983, 14 pages. Proc. of Conference on Inverse Scattering, University of Tulsa, Tulsa, Oklahoma, May 1983.

Gottlieb, D. and E. Turkel: *Spectral methods for time dependent partial differential equations.* ICASE Report No. 83-54, October 5, 1983, 49 pages. Proc. of 3rd 1983 C.I.M.E. Series Conference on Numerical Methods in Fluid Dynamics, Como, Italy, July 7-12, 1983. Lecture Notes in Math., Vol. 1127, Springer-Verlag, 1985, pp. 115-155.

Hall, P.: *The evolution equations for Taylor vortices in the small gap limit.* ICASE Report No. 83-55, October 14, 1983, 15 pages. Phys. Rev. A (3), Vol. 29, 1984, p. 2921.

Adams, L. M. and R. G. Voigt: *Design, development, and use of the finite element machine.* ICASE Report No. 83-56, October 21, 1983, 27 pages. Large Scale Scientific Computations, S. Parter (ed.), Academic Press, 1984.

DiPrima, R. C. and P. Hall: *Complex eigenvalues for the stability of Couette flow.* ICASE Report No. 83-57, October 27, 1983, 47 pages. Proc. Roy. Soc. Ser. (A), Vol. 396, 1984, pp. 75-94.

Rose, M. E.: *Restricted maximum principles for elastic bodies.* ICASE Report No. 83-58, October 28, 1983, 6 pages. Submitted to SIAM J. Appl. Math. but withdrawn.

Mehrotra, P. and T. W. Pratt: *A model for the distributed storage and processing of large arrays.* ICASE Report No. 83-59, October 29, 1983, 49 pages.

Fleming, P. J.: *A nonlinear programming approach to the computer-aided design of regulators using a linear-quadratic formulation.* ICASE Report No. 83-60, October 31, 1983, 25 pages. Internat. J. Control, Vol. 42, No. 1, pp. 257-268.

van Leer, B.: *Multidimensional explicit difference schemes for hyperbolic conservation laws.* ICASE Report No. 83-61, November 1, 1983, 6 pages. Computing Methods in Applied Sciences and Engineering, R. Glowinski and J.-L. Lions (eds.), North-Holland, Amsterdam, 1984, pp. 493-497.

Napolitano, M. and A. Dadone: *Three-dimensional implicit lambda methods*. ICASE Report No. 83-62, November 16, 1983, 21 pages. Revised under the title *Implicit lambda methods for three-dimensional compressible flow*. Proc. of 5th GAMM Conference on Numerical Methods in Fluid Dynamics, Rome, Italy, October 5-7, 1983.

Moss, W. F.: *Spinning mode acoustic radiation from the flight inlet*. ICASE Report No. 83-63, November 29, 1983, 31 pages. Revised under the title *Collocation for an integral equation arising in auct acoustics*. J. Comput. Phys., Vol. 64, No. 2, 1986, pp. 443-458.

Hariharan, S. I. and H. C. Lester: *Acoustic shocks in a variable area duct containing near sonic flows*. ICASE Report No. 83-64, December 1, 1983, 19 pages. J. Comput. Phys., Vol. 58, No. 1, March 1985, pp. 134-145.

Gatski, T. B. and C. E. Grosch: *Embedded cavity drag in steady and unsteady flows*. ICASE Report No. 83-65, December 7, 1983, 33 pages. AIAA Paper No. 84-0436.

Gottlieb, D., M. Y. Hussaini, and S. A. Orszag: *Theory and applications of spectral methods*. ICASE Report No. 83-66, December 19, 1983, 118 pages. Spectral Methods for Partial Differential Equations, R. G. Voigt, D. Gottlieb, M. Y. Hussaini (eds.), SIAM CBMS Series, 1984, pp. 1-54.

ICASE Reports: 1982

Fix, G. J.: *Phase field methods for free boundary problems*. ICASE Report No. 82-1, January 26, 1982, 18 pages. Free Boundary Problems, Theory, and Applications, M. Primicerio and A. Fasano (eds.), Pitman Series, Research Notes and Math., 1982.

Gunzburger, M. D. and J. S. Peterson: *On conforming mixed finite element methods for the inhomogeneous stationary Navier-Stokes equations*. ICASE Report No. 82-2, February 1, 1982, 46 pages. Numer. Math., Vol. 42, 1983, pp. 173-194.

Ito, K.: *Regulator problem for hereditary differential systems with control delays*. ICASE Report No. 82-3, February 10, 1982, 31 pages.

Bayliss, A., C. Goldstein, and E. Turkel: *An iterative method for the Helmholtz equation*. ICASE Report No. 82-4, February 25, 1982, 31 pages. J. Comput. Phys., Vol. 49, 1983, pp. 443-457.

Harten, A., P. D. Lax, and B. van Leer: *On upstream differencing and Godunov-type schemes for hyperbolic conservation laws*. ICASE Report No. 82-5, March 17, 1982, 58 pages. SIAM Rev., Vol. 25, No. 1, January 1983, pp. 35-62.

Maestrello, L. and A. Bayliss: *Flow and far field acoustic amplification properties of heated and unheated jets*. ICASE Report No. 82-6, March 17, 1982, 40 pages. AIAA J., Vol. 20, No. 11, November 1982, pp. 1539-1546.

Pratt, T. W. and G. D. Maydwell: *Experience with the formal semantic definition of HAL/S.* ICASE Report No. 82-7, March 18, 1982, 23 pages. Proc. of Symp. on Compiler Construction, Boston, MA, June 23-25, 1982.

Rose, M. E.: *A numerical scheme to solve div $\underline{u} = \rho, curl\ \underline{u} = \zeta$.* ICASE Report No. 82-8, April 7, 1982, 14 pages.

Adams, L. M. and J. M. Ortega: *A multi-color SOR method for parallel computation.* ICASE Report No. 82-9, April 8, 1982, 12 pages. Proc. of the International Conference on Parallel Processing, K. E. Batcher, W. C. Meilander, and J. L. Potter (eds.), August 24-27, 1982, pp. 53-56.

Daniel, P. L.: *Spline approximations for nonlinear hereditary control systems.* ICASE Report No. 82-10, April 28, 1982, 52 pages. J. Optim. Theory Appl., Vol. 44, No. 4, December 1984, pp. 585-624, (published under the name P. K. Lamm).

Rose, M. E.: *Compact finite differences schemes for the Euler and Navier-Stokes equations.* ICASE Report No. 82-11, April 29, 1982, 12 pages. J. Comput. Phys., Vol. 49, No. 3, March 1983, pp. 420-442.

Gottlieb, D. and L. Lustman: *The spectrum of the Chebyshev collocation operator for the heated equation.* ICASE Report No. 82-12, May 14, 1982, 25 pages. SIAM J. Numer. Anal., Vol. 20, No. 5, October 1983, pp. 909-921.

Gunzburger, M. D., C. H. Liu, and R. A. Nicolaides: *A finite element method for diffusion dominated unsteady viscous flows.* ICASE Report No. 82-13, June 15, 1982, 28 pages. Comput. Methods Appl. Mech. Engrg., Vol. 39, 1983, pp. 55-67.

Mehrotra, P. and T. W. Pratt: *Language concepts for distributed processing of large arrays.* ICASE Report No. 82-14, June 16, 1982, 25 pages. Proc. of Symp. on Principles of Distributed Computing, Ottawa, Canada, August 1982.

Wong, Y. S. and M. M. Hafez: *A minimal residual method for transonic potential flows.* ICASE Report No. 82-15, June 25, 1982, 10 pages. Lecture Notes in Physics, No. 170, E. Krause (ed.), Springer-Verlag, 1982, Proc. of the 8th Intl. Conf. on Numerical Methods in Fluid Dynamics, Aachen, Germany, pp. 526-532. Also a technical note under the title *Comments on some iterative schemes for transonic potential flows,* submitted to AIAA J.

Rosen, I. G.: *Difference equation state approximations for nonlinear hereditary control problems.* ICASE Report No. 82-16, June 30, 1982, 50 pages. SIAM J. Control Optim., Vol. 22, No. 2, March 1984, pp. 302-326.

Wenzel, A. R.: *Radiation and attenuation of low- and high-frequency waves in a random medium.* ICASE Report No. 82-17, July 9, 1982, 21 pages. Wave Motion, Vol. 5, 1983, pp. 215-223.

Lakin, W. D. and M. Y. Hussaini: *Stability of the laminar boundary layer in a streamwise corner.* ICASE Report No. 82-18, July 12, 1982, 28 pages. Proc. Roy. Soc. London (A), Vol. 393, 1984, pp. 101-116.

Cox, C. L., G. J. Fix, and M. D. Gunzburger: *A least squares finite element scheme for transonic flow around harmonically oscillating wings.* ICASE Report No. 82-19, July 16, 1982, 28 pages. J. Comput. Phys., Vol. 51, No. 3, September 1983, pp. 387-403.

Bayliss, A. and E. Turkel: *The Helmholtz equation for nozzles and underwater acoustics.* ICASE Report No. 82-20, August 2, 1982, 7 pages. Scientific Computing, R. S. Stepleman (ed.), North Holland Publishing Company, 1983.

Banks, H. T.: *Distributed system optimal control and parameter estimation: Computational techniques using spline approximations.* ICASE Report No. 82-21, August 4, 1982, 7 pages. Invited lecture in Proc. 3rd IFAC Symposium on Control of Distributed Parameter Systems, Toulouse, France, June 29-July 2, 1982, Pergamon Press.

Banks, H. T. and J. M. Crowley: *Parameter estimation in Timoshenko beam.* ICASE Report No. 82-22, August 4, 1982, 30 pages. J. Astronaut. Sci., Vol. 31, No. 3, July/September 1983, pp. 381-397.

Turkel, E.: *Progress in computational physics.* ICASE Report No. 82-23, August 5, 1982, 69 pages. Comput. and Fluids, Vol. 11, 1983, pp. 121-144.

Hussaini, M. Y., T. A. Zang, and M. D. Salas: *Shock-fitted Euler solutions to shock-vortex interactions.* ICASE Report No. 82-24, August 16, 1982, 11 pages. Lecture Notes in Physics, No. 170, E. Krause (ed.), Springer-Verlag, 1982, Proc. of the 8th Intl. Conf. on Numerical Methods in Fluid Dynamics, Aachen, Germany, pp. 461-467.

Najfeld, I.: *Numerical analysis of Weyl's method for integrating boundary layer equations.* ICASE Report No. 82-25, August 27, 1982, 21 pages.

Banks, H. T., P. L. Daniel, and E. S. Armstrong: *Parameter estimation for static models of the maypole hoop/column antenna surface.* ICASE Report No. 82-26, September 9, 1982, 3 pages. Proc. 1982 IEEE Intl. Large Scale Systems Symp., Virginia Beach, Virginia, October 11-13, 1982.

Bokhari, S.: *Finding maximum on an array processor with a global bus.* ICASE Report No. 82-27, September 16, 1982, 28 pages. IEEE Trans. Comput., Vol. C-33, No. 2, February 1984, pp. 133-139.

Abarbanel, S. S., D. L. Dwoyer, and D. Gottlieb: *Improving the convergence rate of parabolic ADI methods.* ICASE Report No. 82-28, September 20, 1982, 41 pages. J. Comp. Phys., Vol. 67, No. 1, November 1986.

Ito, K.: *On the approximations of eigenvalues associated with functional differential equations.* ICASE Report No. 82-29, September 23, 1982, 27 pages. J. Differential Equations, Vol. 60, 1985, pp. 285-300.

van Leer, B.: *Flux-vector splitting for the Euler equations.* ICASE Report No. 82-30, September 28, 1982, 13 pages. Lecture Notes in Physics, No. 170, E. Krause (ed.), Springer-Verlag, 1982, Proc. of the 8th Intl. Conf. on Numerical Methods in Fluid Dynamics, Aachen, Germany, pp. 507-512.

Banks, H. T., I. G. Rosen, and K. Ito: *A spline based technique for computing Riccati operators and feedback controls in regulator problems for delay equations.* ICASE Report No. 82-31, September 29, 1982, 49 pages. SIAM J. Sci. Statist. Comput., Vol. 5, No. 4, December 1984, pp. 830-855.

Banks, H. T. and P. L. Daniel: *Estimation of variable coefficients in parabolic distributed systems.* ICASE Report No. 82-32, November 1, 1982, 52 pages. IEEE Trans. Automat. Control, AC-30, 1985, pp. 386-398.

Tadmor, E.: *The unconditional instability of inflow-dependent boundary conditions in difference approximations to hyperbolic systems.* ICASE Report No. 82-33, November 10, 1982, 22 pages. Math. Comp., Vol. 41, No. 164, October 1983, pp. 309-319.

Harten, A.: *On a large time-step high resolution scheme.* ICASE Report No. 82-34, November 15, 1982, 20 pages. Math. Comp., Vol. 46, 1986, pp. 379-399.

Osher, S.: *Smoothing for spectral methods.* ICASE Report No. 82-35, November 16, 1982, 12 pages. Spectral Methods for Partial Differential Equations, R. G. Voigt, D. Gottlieb, M. Y. Hussaini (eds.), SIAM-CBMS Series, 1984, pp. 209-216.

Gannon, D. and J. R. Van Rosendale: *Highly parallel multigrid solvers for elliptic PDEs: An experimental analysis.* ICASE Report No. 82-36, November 17, 1982, 38 pages. Journal of Parallel and Distributed Computing, Vol. 3, No. 1, March 1986, pp. 106-135.

Friedland, S. and E. Tadmor: *Optimality of the Lax-Wendroff condition.* ICASE Report No. 82-37, November 23, 1982, 12 pages. Linear Algebra Appl., Vol. 56, 1983, pp. 309-319.

Gottlieb, D., L. Lustman, and C. Streett: *Spectral methods for two-dimensional shocks.* ICASE Report No. 82-38, November 24, 1982, 25 pages. Spectral Methods for Partial Differential Equations, R. G. Voigt, D. Gottlieb, M. Y. Hussaini (eds.), SIAM-CBMS Series, 1984, pp. 79-95.

Abarbanel, S. S., D. L. Dwoyer, and D. Gottlieb: *Stable implicit finite-difference methods for three-dimensional hyperbolic systems.* ICASE Report No. 82-39, November 26, 1982, 25 pages. Accepted and withdrawn from J. Comput. Phys.

Hussaini, M. Y. and T. A. Zang: *Iterative spectral methods and spectral solutions to compressible flows.* ICASE Report No. 82-40, November 30, 1982, 30 pages. Spectral Methods for Partial Differential Equations, R. G. Voigt, D. Gottlieb, M. Y. Hussaini (eds.), SIAM-CBMS Series, 1984, pp. 119-140.

Geer, J. F. and J. C. Strikwerda: *Vertical slender jets with surface tensions.* ICASE Report No. 82-41, December 16, 1982, 29 pages. J. Fluid Mech., Vol. 135, 1983, pp. 155-169.

Tadmor, E.: *Skew-selfadjoint form for systems of conservation laws.* ICASE Report No. 82-42, December 23, 1982, 22 pages. J. Math. Anal. Appl., Vol. 103, 1984, pp. 428-442.

ICASE Reports: 1981

Van Albada, G. D. and W. W. Roberts, Jr.: *A high resolution study of the gas-flow in barred spirals.* ICASE Report No. 81-1, January 8, 1981, 34 pages. Astrophys. J., Vol. 246, June 1981, pp. 740-750.

Bauschlicher, C. W., Jr., P. S. Bagus, D. R. Yarkony, and B. H. Lengsfield, III: *A hybrid method for improving MCSCF convergence.* ICASE Report No. 81-2, January 12, 1981, 19 pages. J. Chem. Phys., Vol. 74, No. 4, February 15, 1981, pp. 2379-2383.

Fix, G. J., M. D. Gunzburger, and R. A. Nicolaides: *On mixed finite element methods for first order elliptic systems.* ICASE Report No. 81-3, January 15, 1981, pp. 2379-2383.

Philips, R. B. and M. E. Rose: *Compact difference schemes for mixed initial boundary value problems - I.* ICASE Report No. 81-4, January 21, 1981, 24 pages. SIAM J. Numer. Anal., Vol. 19, No. 4, August 1982, pp. 698-720.

Levinson, F. H. and W. W. Roberts, Jr.: *A cloud/particle model of the interstellar medium - galactic spiral structure.* ICASE Report No. 81-5, January 23, 1981, 50 pages. Astrophys. J., Vol. 245, 1982, pp. 465-481.

Bokhari, S.: *A shortest tree algorithm for optimal assignments across space and time in a distributed processor system.* ICASE Report No. 81-6, January 27, 1981, 24 pages. IEEE Trans. Software Engrg., Vol. 7, No. 6, November 1981, pp. 583-589.

Gunzburger, M. D. and R. A. Nicolaides: *The computational accuracy of some finite element methods for incompressible viscous flow problems.* ICASE Report No. 81-7, February 3, 1981, 19 pages. This report is combined with ICASE Report No. 81-23. SIAM J. Sci. Statist. Comput., Vol. 8, 1982, pp. 167-179.

Bayliss, A. and L. Maestrello: *Simulation of instabilities and sound radiation in a jet.* ICASE Report No. 81-8, February 5, 1981, 33 pages. AIAA J., Vol. 19, No. 7, 1981, pp. 835-841.

Vardi, A.: *A trust region algorithm for equality constrained minimization: Convergence properties and implementation.* ICASE Report No. 81-9, February 18, 1981, 35 pages. SIAM J. Numer. Anal., Vol. 22, No. 3, June 1985, pp. 575-591.

Anderson, T. and J. C. Knight: *Practical software fault tolerance for real time systems.* ICASE Report No. 81-10, March 31, 1981, 39 pages. IEEE Trans. on Software Engrg., Vol. SE9, No. 3, May 1983, pp. 155-164.

van Leer, B.: *On the relation between the upwind-differencing schemes of Godunov, Engquist-Osher, and Roe.* ICASE Report No. 81-11, March 16, 1981, 38 pages, NASA CR-165877. SIAM J. Sci. Statist. Comput., Vol. 5, No. 1, March 1984, pp. 1-20.

Lambiotte, J. J., S. Bokhari, M. Y. Hussaini, and S. A. Orszag: *Navier-Stokes solution of the CYBER-203 by a pseudospectral technique.* ICASE Report No. 81-12, March 27, 1982, 18 pages. 10th IMACS World Congress on System Simulation and Scientific Computation, Vol. 1, August 8-13, 1982, Montreal, Canada, pp. 305-307.

Davis, S. F. and J. E. Flaherty: *An adaptive finite element method for initial-boundary value problems for partial differential equations.* ICASE Report No. 81-13, March 30, 1981, 42 pages. SIAM J. Sci. Statist. Comput., Vol. 3, No. 1, March 1982, pp. 6-27.

Hariharan, S. and E. Stephan: *A boundary element method for a two-dimensional interface problem in electromagnetics.* ICASE Report No. 81-14, April 28, 1981, 17 pages. Numer. Math., Vol. 42, 1983, pp. 311-322.

Malik, M. R., S. Chuang, and M. Y. Hussaini: *Accurate numerical solution of comp essible, linear stability equations.* ICASE Report No. 81-15, May 19, 1981, 15 pages. J. Applied Mathematics and Physics (ZAMP), Vol. 33, March 1982, pp. 189-201.

Banks, H. T. and K. Kunisch: *An approximation theory for nonlinear partial differential equations with applications to identification and control.* ICASE Report No. 81-16, May 20, 1981, 84 pages. SIAM J. Control Optim., Vol. 20, No. 6, November 1982, pp. 815-849.

Hariharan, S.: *Inverse scattering for an exterior Dirichlet problem.* ICASE Report No. 81-17, May 26, 1981, 23 pages. Quart. Appl. Math., October 1982, pp. 273-286.

Philips, R. B. and M. E. Rose: *Compact finite difference schemes for mixed initial-boundary value problems - II.* ICASE Report No. 81-18, June 15, 1981, 49 pages. SIAM J. Numer. Anal., Vol. 19, No. 4, August 1982, pp. 698-720.

Najfeld, I.: *Discrete Fourier transform of vector sets and perturbations of circulant matrices.* ICASE Report No. 81-19, July 17, 1981, 11 pages.

Bayliss, A. and L. Maestrello: *On the interaction of a sound pulse with the shear layer of an axisymmetric jet, II. Heated jets.* ICASE Report No. 81-20, July 20, 1981, 34 pages. J. Sound Vibration, Vol. 86, 1982, pp. 395-409.

Rose, M. E.: *A finite difference scheme for compressible Navier-Stokes equations and a relationship to the Euler equation.* ICASE Report No. 81-21, July 22, 1981, 24 pages. Revised under the title *Compact finite difference scheme for the Euler and Navier-Stokes equations,* ICASE Report No. 82-11. J. Comput. Phys., Vol. 49, No. 3, March 1983, pp. 420-442.

Schwartz, J. T.: *Finding the minimum distance between two convex polygons.* ICASE Report No. 81-22, July 30, 1981, 8 pages. Inform. Process. Lett., Vol. 13, Issue No. 4 and 5, 1981, pp. 168-170.

Gunzburger, M. D., R. Nicolaides, and J. S. Peterson: *On conforming mixed finite element methods for incompressible viscous flow problems.* ICASE Report No. 81-23, July 23, 1981, 29 pages. This report was combined with ICASE Report No. 81-7. Comput. Math. Appl., Vol. 8, 1982, pp. 167-179.

Van Albada, G. D., B. van Leer, and W. W. Roberts, Jr.: *A comparative study of computational methods in cosmic gas dynamics.* ICASE Report No. 81-24, August 3, 1981, 32 pages. Astronom. and Astrophys., Vol. 108, 1982, pp. 76-84.

Wenzel, A. R.: *Radiation and attenuation of waves in a random medium.* ICASE Report No. 81-25, August 5, 1981, 53 pages. Acous. Soc. Amer., Vol. 71, January 1982, pp. 26-35.

Banks, H. T.: *A survey of some problems and recent results for parameter estimation and optimal control in delay and distributed parameter systems.* ICASE Report No. 81-26, August 17, 1981, 28 pages. Proc. of Conference on Volterra and Functional Differential Equations, VPI and SU, Blacksburg, VA, June 10-13, 1981.

Bayliss, A. and E. Turkel: *Far field boundary conditions for compressible flows.* ICASE Report No. 81-27, August 25, 1981, 19 pages. Proc. of the Symposium on Numerical Boundary Condition Procedures, NASA Ames Research Center, Moffett Field, CA, October 19-20, 1981. J. Comput. Phys., Vol. 48, No. 2, November 1982, pp. 182-199.

Zang, T. A., Y. S. Wong, and M. Y. Hussaini: *Spectral multi-grid methods for elliptic equations.* ICASE Report No. 81-28, August 31, 1981, 24 pages. J. Comput. Phys., Vol. 48, No. 3, December 1982, pp. 485-501.

Abarbanel, S. and E. M. Murman: *Stability of two-dimensional hyperbolic initial boundary value problems for explicit and implicit schemes.* ICASE Report No. 81-29, August 31, 1981, 9 pages. J. Comput. Phys., Vol. 48, No. 2, November 1982, pp. 160-167.

Wong, Y. S. and M. M. Hafez: *Preconditioned conjugate gradient methods for transonic flow calculations.* ICASE Report No. 81-30, September 16, 1981, 22 pages. Preconditioning Techniques, D. J. Evans (ed.), Gordon and Breach, Ltd., New York, 1982. A version emphasizing applications appeared under the title *Conjugate gradient methods applied to transonic finite difference and finite element calculations,* in the AIAA J., Vol. 20, No. 11, November 1982, pp. 1526-1533.

Schwartz, J. T.: *Comments on highly reliable software for avionics applications.* ICASE Report No. 81-31, September 23, 1981, 21 pages. Proc. of the National Computer Conference, sponsored by AFIPS, Houston, Texas, June 7-10, 1982.

Banks, H. T. and P. L. Daniel: *Parameter estimation of nonlinear nonautonomous distributed systems.* ICASE Report No. 81-32, October 6, 1981, 5 pages. Proc. of the 20th IEEE Conference on Decision and Control, San Diego, California, December 16-20, 1981, pp. 228-232.

Banks, H. T. and I. G. Rosen: *Spline approximations for linear nonautonomous delay systems.* ICASE Report No. 81-33, October 9, 1981, 60 pages. J. Math. Anal. Appl., Vol. 96, No. 1, October 15, 1983, pp. 226-268.

Harten, A.: *On the symmetric form of systems of conservation laws with entropy.* ICASE Report No. 81-34, October 15, 1981, 20 pages. J. Comput. Phys., Vol. 49, No. 1, January 1983, pp. 151-164.

Gatski, T. B., C. E. Grosch, and M. E. Rose: *A numerical study of the two-dimensional Navier-Stokes equations in vorticity-velocity variables.* ICASE Report No. 81-35, November 3, 1981, 24 pages. J. Comput. Phys., Vol. 48, No. 1, October 1982, pp. 1-22.

Rosen, I. G.: *Discrete approximation methods for parameter identification in delays systems.* ICASE Report No. 81-36, November 9, 1981, 67 pages. SIAM J. Control Optim., Vol. 22, No. 1, January 1984, pp. 95-120.

Fix, G. J., D. N. Lee, and G. Liang: *Stable finite elements for the Navier-Stokes equations.* ICASE Report No. 81-37, November 19, 1981, 11 pages. Numer. Math., Vol. 37, 1981, pp. 29-48.

Banks, H. T. and J. M. Crowley: *Parameter estimation for distributed systems arising in elasticity.* ICASE Report No. 81-38, December 1, 1981, 20 pages. Invited lecture, NCKU/AAS Symposium on Engineering Sciences and Mechanics, National Cheng Kung University, Tainan, Taiwan, December 28, 1981 - January 1, 1982.

Gunzburger, M. D. and R. A. Nicolaides: *Stability of Gaussian elimination without pivoting on tridiagonal Toeplitz matrices.* ICASE Report No. 81-39, December 2, 1981, 9 pages. Linear Algebra Appl., Vol. 45, 1982, pp. 21-28.

Teglas, R. G.: *On the control canonical structure of a class of scalar input systems.* ICASE Report No. 81-40, December 14, 1981, 31 pages. Replaced by ICASE Report No. 83-18 which appeared in SIAM J. Control Optim., Vol. 22, No. 4, July 1984, pp. 552-569.

Fix, G. J. and E. Stephan: *Finite element methods of the least squares type for regions with corners.* ICASE Report No. 81-41, December 16, 1981, 15 pages. Comput. Math. Appl., Vol. 10, 1985, pp. 463-476.

Gottlieb, D. and L. Lustman: *The DuFort-Frankel Chebyshev method for parabolic initial boundary value problems.* ICASE Report No. 81-42, December 28, 1981, 25 pages. Comput. and Fluids, Vol. 11, No. 2, 1983, pp. 107-120.

ICASE Reports: 1980

Bayliss, A., M. D. Gunzburger, and E. Turkel: *Boundary conditions for the numerical solution of elliptic equations in exterior regions.* ICASE Report No. 80-1, January 11, 1980, 45 pages. SIAM J. Appl. Math., Vol. 42, No. 2, April 1982, pp. 430-451.

Bauschlicher, C. W.: *Singlet-triplet separation in CBr_2*. ICASE Report No. 80-2, January 21, 1980, 11 pages. J. Amer. Chem. Soc., Vol. 102, 1980, pp. 54-92.

Wray, A. and M. Y. Hussaini: *Numerical experiments in boundary layer stability*. ICASE Report No. 80-3, January 22, 1980, 9 pages. Proc. Roy. Soc. London (A), Vol. 392, 1984, pp. 373-389.

Bauschlicher, C. W.: *Accurate ab initio calculations for the $^1B_1 - ^1A_1$ separation in methylene*. ICASE Report No. 80-4, January 23, 1980, 11 pages. Chem. Phys. Lett., Vol. 74, No. 2, 1980, pp. 273-276.

Klopfer, G. and M. Y. Hussaini: *A study of formation of intense shear layers in transitional boundary layers*. ICASE Report No. 80-5, January 31, 1980, 31 pages.

Abarbanel, S. and D. Gottlieb: *Optimal time splitting for two- and three-dimensional Navier-Stokes equations with mixed derivatives*. ICASE Report No. 80-6, February 18, 1980, 43 pages. J. Comput. Phys., Vol. 41, No. 1, May 1981, pp. 1-33.

Strikwerda, J. C. and J. F. Geer: *A numerical method for computing the shape of a vertical slender jet*. ICASE Report No. 80-7, March 24, 1980, 35 pages. SIAM J. Sci. Statist. Comput., Vol. 1, 1980, pp. 449-466.

Bauschlicher, C. W. and I. Shavitt: *A low energy passage for $C^+ + H_2CH^+(^1\Sigma^+) + H$*. ICASE Report No. 80-8, April 8, 1980, 11 pages. Chem. Phys. Lett., Vol. 75, 1980, pp. 62-65.

Bauschlicher, C. W.: *CI superposition error caused by bond functions*. ICASE Report No. 80-9, April 11, 1980, 9 pages. Chem. Phys. Lett., Vol. 74, No. 2, 1980, pp. 277-279.

Bayliss, A. and L. Maestrello: *The near field interaction between a sound pulse and a jet shear layer*. ICASE Report No. 80-10, April 11, 1980, 10 pages. Proc. of the AIAA 6th Aeroacoustics Conference, Palo Alto, California, June 4-6, 1980, AIAA Paper No. 80-0960.

Eiseman, P. R.: *Geometric methods in computational fluid dynamics*. ICASE Report No. 80-11, April 18, 1980, 177 pages. Von Karman Institute Lectures, June 1980.

Fix, G. F. and R. A. Nicolaides: *An analysis of mixed finite element approximations for periodic acoustic wave propagation*. ICASE Report No. 80-12, April 25, 1980, 17 pages. SIAM J. Numer. Anal., Vol. 17, No. 6, December 1980, pp. 779-786.

Cox, B. and C. W. Bauschlicher: *Surface relaxation and induced stress accompanying the absorption of H upon BE (0001)*. ICASE Report No. 80-13, June 4, 1980, 27 pages. Surface Science, Vol. 102, 1981, p. 295.

Lengsfield, B., J. Jafri, D. Phillips, and C. Bauschlicher: *On the use of corresponding orbitals in calculation of non-orthogonal transition moments*. ICASE Report No. 80-14, June 12, 1980, 26 pages. J. Chem. Phys., Vol. 74, 1982, p. 6849.

Zang, T. A. and M. Y. Hussaini: *Mixed spectral finite difference approximations for slightly viscous flows.* ICASE Report No. 80-15, June 20, 1980, 6 pages. Proc. of the 7th International Conference on Numerical Methods in Fluid Dynamics, Stanford, California, Lecture Notes in Physics, W. Reynolds and R. MacCormack (eds.), Springer-Verlag, 1981.

Eiseman, P. R.: *Coordinate generation with precise controls.* ICASE Report No. 80-16, June 20, 1980, 6 pages. Proc. of the 7th International Conference on Numerical Methods in Fluid Dynamics, Stanford, California, Lecture Notes in Physics, W. Reynolds and R. MacCormack (eds.), Springer-Verlag, 1981.

Bauschlicher, C. W., B. Lengsfield, and D. Yarkony: *On the low lying singlet states of BeO.* ICASE Report No. 80-17, July 14, 1980, 12 pages. J. Chem. Phys., Vol. 73, No. 11, 1980, pp. 5702-5705.

Bauschlicher, C. W., B. Lengsfield, and D. Yarkony: *MCSCF for excited states.* ICASE Report No. 80-18, July 14, 1980, 3 pages. Proc. of the National Resources for Computation in Chemistry Workshop at Lawrence Berkeley Laboratory, College Station, Texas, 1980.

Lengsfield, B. and C. W. Bauschlicher: *On the convergence properties of the density matrix directed general second order MCSF algorithm.* ICASE Report No. 80-19, July 14, 1980, 5 pages. Proc. of the National Resources for Computation in Chemistry Workshop at Lawrence Berkeley Laboratory, College Station, Texas, 1980.

Rose, M. E.: *A unified numerical treatment of the wave equation and the Cauchy-Riemann equation.* ICASE Report No. 80-20, July 14, 1980, 11 pages. SIAM J. Numer. Anal., Vol. 18, No. 2, April 1981, pp. 372-376.

Bayliss, A. and E. Turkel: *Outflow boundary conditions for fluid dynamics.* ICASE Report No. 80-21, August 7, 1980, 23 pages. SIAM J. Sci. Statist. Comput., Vol. 3, No. 2, 1982, pp. 250-259.

Nicolaides, R. A.: *Co-energy methods for elliptic flow and related problems.* ICASE Report No. 80-22, August 18, 1980, 20 pages. Proc. of Elliptic Problem Solvers, held under auspices of Los Alamos Scientific Laboratory, Santa Fe, New Mexico, June 30-July 2, 1980.

Brandt, A.: *Multi-grid solvers on parallel computers.* ICASE Report No. 80-23, August 18, 1980, 20 pages. Proc. of Elliptic Problem Solvers, M. Schultz (ed.), Academic Press, 1981, pp. 39-84.

Abarbanel, S. and D. Gottlieb: *On improving the 2-4 two-dimensional leap frog scheme.* ICASE Report No. 80-24, September 22, 1980, 11 pages. SIAM J. Sci. Statist. Comput., Vol. 1, No. 4, December 1980, pp. 426-430.

Lin, C. and W. W. Roberts, Jr.: *Some fluid dynamical problems in jalaxies.* ICASE Report No. 80-25, October 15, 1980, 36 pages. Annual Review of Fluid Mechanics, Vol. 13, 1981, pp. 35-55.

Bona, J., W. P. Pritchard, and L. R. Scott: *An evaluation of a model equation for water waves.* ICASE Report No. 80-26, October 16, 1980, 107 pages. Philos. Trans. Roy. Soc. London, Vol. 302, No. 1471, September 1981, pp. 457-510.

Strikwerda, J. C. and K. R. Bube: *Interior regularity estimates for elliptic systems of difference equations.* ICASE Report No. 80-28, October 21, 1980, 51 pages. SIAM J. Numer. Anal., Vol. 20, No. 4, August 1983, pp. 653-670.

Anderson, C. and J. F. Geer: *Power series expansions for the frequency and period of the limit cycle of the van der Pol equation.* ICASE Report No. 80-29, October 29, 1980, 29 pages. SIAM J. Appl. Math., Vol. 43, No. 3, 1982, pp. 678-693.

Eiseman, P. R.: *Coordinate generation with precise controls over mesh properties.* ICASE Report No. 80-30, November 14, 1980, 71 pages. J. Comput. Phys., Vol. 47, No. 3, September 1982, pp. 331-351.

Hariharan, S. I.: *On the normal stress effects of incompressible non-Newtonian fluids.* ICASE Report No. 80-31, November 14, 1980, 14 pages. J. Franklin Inst., Vol. 312, No. 2, 1981, pp. 109-119.

McKendry, M. and R. Campbell: *Capabilities for high level languages.* ICASE Report No. 80-32, November 24, 1980, 28 pages.

Levinson, F. and W. W. Roberts, Jr.: *Insights into the gas dynamics in galaxies via a particle model.* ICASE Report No. 80-33, November 25, 1980, 15 pages. Proc. of the 12th International Symposium on Rarefield Gas Dynamics, S. Fisher (ed.), Charlottesville, Virginia, July 7-11, 1980.

Gottlieb, D., L. Lustman, and S. Orszag: *Spectral calculations of one-dimensional inviscid compressible flows.* ICASE Report No. 80-34, December 4, 1980, 44 pages. SIAM J. Sci. Statist. Comput., Vol. 2, No. 3, September 1981, pp. 296-310.

Vardi, A.: *A trust region algorithm for unconstrained minimization convergence properties and implementation.* ICASE Report No. 80-35, December 4, 1980, 31 pages.

Campbell, R. and P. Richards: *SAGA - A system to automate the management of software production.* ICASE Report No. 80-36, December 16, 1980, 12 pages. AFIPS Conference Proc. of the 1981 National Computer Conference, Alex Orden (ed.), Chicago, Illinois, May 4-7, 1981, AFIPS Press, Arlington, Virginia, pp. 231-234.

ICASE Reports: 1979

Harten, A. and H. Tal-Ezer: *On a fourth-order accurate implicit finite difference scheme for hyperbolic conservation laws: I. Non-stiff strongly dynamic problems.* ICASE Report No. 79-1, January 9, 1979, 46 pages. Math. Comp., Vol. 36, No. 154, April 1981, pp. 353-373.

Rudy, D. and J. Strikwerda: *A non-reflecting outflow boundary condition for subsonic Navier-Stokes calculations*. ICASE Report No. 79-2, January 12, 1979, 27 pages. J. Comput. Phys., Vol. 36, No. 1, June 1980, pp. 55-70.

Bauschlicher, C. W.: *The construction of modified virtual orbitals (MVO's) which are suited for configuration interaction calculations*. ICASE Report No. 79-3, January 17, 1979, 14 pages. J. Chem. Phys., Vol. 72, 1980, pp. 880-885.

Rose, M. E.: *An artificial energy method for calculating flows with shocks*. ICASE Report No. 79-4, January 23, 1979, 8 pages. J. Comput. Phys., Vol. 38, No. 1, November 1980, pp. 107-113.

Strikwerda, J. C.: *Iterative methods for the numerical solution of second order elliptic equations with large first order terms*. ICASE Report No. 79-5, February 8, 1979, 24 pages. SIAM J. Sci. Statist. Comput., Vol. 1, No. 1, March 1980, pp. 119-130.

Bayliss, A. and E. Turkel: *Dynamics acoustics for the STAR-100*. ICASE Report No. 79-6, March 7, 1979, 11 pages. Advances in Computer Methods for Partial Differential Equations III, R. Vichnevetsky and R. Stepleman (eds.), IMACS, 1979, pp. 61-64.

Bayliss, A. and E. Turkel: *Boundary conditions for exterior acoustic problems*. ICASE Report No. 79-7, March 30, 1979, 6 pages. Advances in Computer Methods for Partial Differential Equations III, R. Vichnevetsky and R. Stepleman (eds.), IMACS, 1979, pp. 127-131.

Brandt, A.: *Multi-level adaptive finite element methods: I. Variational problems*. ICASE Report No. 79-8, April 2, 1979, 71 pages. Special Topics of Applied Mathematics, D. Pallaschke and U. Trottenberg (eds.), North Holland, 1980, pp. 91-128.

Anderson, T. and P. A. Lee: *The provision of recoverable interfaces*. ICASE Report No. 79-9, April 16, 1979, 14 pages. Digest of Papers, FTCS-9, Madison, Wisconsin, June 1979.

Harten, A. and H. Tal-Ezer: *On a fourth-order accurate implicit finite difference scheme for hyperbolic conservation laws, II. Five-point schemes*. ICASE Report No. 79-10, June 1, 1979, 42 pages. J. Comput. Phys., Vol. 41, No. 2, June 1981, pp. 329-356.

Raffenetti, R. and D. Phillips: *Gaseous NH_4Cl revisited: A computational investigation of the potential surface and properties*. ICASE Report No. 79-11, June 5, 1979, 28 pages. J. Chem. Phys., Vol. 71, December 1979, pp. 4534-4540.

Bona, J., W. P. Pritchard, and L. R. Scott: *Solitary-wave interaction*. ICASE Report No. 79-12, June 21, 1979, 10 pages. Phys. Fluids, Vol. 23, 1980, pp. 438-441.

Dupont, T. and L. R. Scott: *Polynomial approximation of functions in Sobolev spaces*. ICASE Report No. 79-13, June 29, 1979, 48 pages. Math. Comp., Vol. 34, 1980, pp. 441-463.

Bokhari, S.: *Optimal assignments in dual-processor distributed systems under varying load conditions*. ICASE Report No. 79-14, July 5, 1979, 39 pages.

Brandt, A.: *Multi-grid solutions to elliptic flow problems.* ICASE Report No. 79-15, July 6, 1979. Proc. of the Conference on Numerical Solution of Partial Differential Equations, Mathematics Research Center, University of Wisconsin, Madison, WI, October 1978.

Bokhari, S.: *On the mapping problem.* ICASE Report No. 79-16, July 24, 1979, 10 pages. IEEE Trans. Computers, Vol. C-30, No. 3, March 1981, pp. 207-214.

Gottlieb, D.: *The stability of pseudospectral Chebyshev methods.* ICASE Report No. 79-17, August 6, 1979, 24 pages. Math. Comp., Vol. 36, No. 153, January 1981, pp. 107-118.

Rudy, D. and J. C. Strikwerda: *Boundary conditions for subsonic compressible Navier-Stokes calculations.* ICASE Report No. 79-18, August 6, 1979, 30 pages. Comput. and Fluids, Vol. 9, 1982, pp. 327-338.

Brandt, A.: *Multi-level adaptive finite element computations in fluid dynamics.* ICASE Report No. 79-19, August 7, 1979, 9 pages. AIAA J., Vol. 18, 1980, pp. 1165-1172.

Turkel, E.: *Numerical methods for large-scale, time-dependent partial differential equations.* ICASE Report No. 79-20, August 20, 1979, 136 pages. Computational Fluid Dynamics, W. Kollman (ed.), Hemisphere Publishing Corp., Washington, 1980, pp. 128-262.

Wenzel, A. R.: *Spectral broadening of waves propagating in a random medium.* ICASE Report No. 79-21, September 4, 1979, 37 pages (a revision of ICASE Report No. 78-11). J. Math. Phys., Vol. 21, No. 8, August 1980, pp. 2131-2139.

Nicolaides, R. A.: *Existence, uniqueness and approximation for generalized saddle point problems.* ICASE Report No. 79-22, September 4, 1979, 22 pages. SIAM J. Numer. Anal., Vol. 19, No. 2, April 1982, pp. 349-357.

Geer, J. R. and J. C. Strikwerda: *Vertical slender jets.* ICASE Report No. 79-23, September 12, 1979, 18 pages. J. Fluid Mech., Vol. 101, 1980, pp. 53-63.

Jameson, A. and E. Turkel: *Implicit schemes and LU decompositions.* ICASE Report No. 79-24, September 17, 1979, 23 pages. Math. Comp., Vol. 37, No. 156, October 1981, pp. 385-397.

Bauschlicher, C. W.: *Improved CI formula evaluation: The elimination of the phase determination level for arbitrarily coupled CSF's.* ICASE Report No. 79-25, September 20, 1979, 5 pages. Intl. J. Quant. Chem., Vol. 19, 1981, p. 649.

Bayliss, A. and E. Turkel: *Radiation boundary conditions for wave-like equations.* ICASE Report No. 79-26, October 1, 1979, 31 pages. Comm. Pure Appl. Math., Vol. 33, 1980, pp. 707-726.

Bagus, P. and C. W. Bauschlicher: *Core binding energy shifts for free negative ions of oxygen: 0^0 to $0^=$.* ICASE Report No. 79-27, October 8, 1979, 14 pages. J. Electron Spectroscopy and Related Phenomena, Vol. 20, 1980, p. 183.

Harten, A. and P. D. Lax: *A random choice finite difference scheme for hyperbolic conservation laws (a preliminary report)*. ICASE Report No. 79-28, October 12, 1979, 57 pages. SIAM J. Numer. Anal., Vol. 18, No. 2, April 1981, pp. 289-315.

Hussaini, M. Y., B. Baldwin, and R. MacCormack: *Asymptotic features of shock-wave, boundary-layer interaction*. ICASE Report No. 79-29, October 29, 1979, 14 pages. AIAA J., Vol. 18, No. 8, 1980, pp. 1014-1016.

Bauschlicher, C. W. and D. Yarkony: *MCSCF wavefunctions for excited states of polar molecules: Application to BeO*. ICASE Report No. 79-30, October 30, 1979, 30 pages. J. Chem. Phys., Vol. 2, No. 2, 1980, pp. 1138-1144.

Maestrello, L., A. Bayliss, and E. Turkel: *On the interaction between a sound pulse with the shear layer of an axisymmetric jet*. ICASE Report No. 79-31, December 19, 1979, 47 pages. J. Sound Vibration, Vol. 74, No. 2, January 1981, pp. 281-301.

Gottlieb, D., S. A. Orszag, and E. Turkel: *Stability in pseudospectral and finite difference methods for variable coefficient problems*. ICASE Report No. 79-32, December 20, 1979, 27 pages. Math. Comp., Vol. 37, No. 156, October 1981, pp. 293-305.

Bauschlicher, C. W., D. Silver, and D. Yarkony: *An SCF and MCSCF description of the low lying states of MgO*. ICASE Report No. 79-33, December 21, 1979, 16 pages. J. Chem. Phys., Vol. 73, 1980, pp. 2867-2870.

ICASE Reports: 1978

Gottlieb, D. and E. Turkel: *On time discretizations for spectral methods*. ICASE Report No. 78-1, January 11, 1978, 30 pages. Stud. Appl. Math., Vol. 63, 1980, pp. 67-86.

Zang, T. A. and F. Hohl: *Computer experiments on the effect of retrograde stars in disk galaxies*. ICASE Report No. 78-2, January 17, 1978, 47 pages. Astrophys. J., Vol. 226, 1978, pp. 521-539.

Hamlin, G. H., Jr. and T. Crockett: *A microprocessor assisted graphics system*. ICASE Report No. 78-3, January 31, 1978, 14 pages. SIGGRAPH '78, Proceedings, Vol. 12, No. 3, August 1978, pp. 313-317.

Bauschlicher, C. W. and D. Yarkony: *Electronic structure of CaO: 1*. ICASE Report No. 78-4, February 1, 1978, 29 pages. J. Chem. Phys., Vol. 68, No. 9, May 1978, pp. 3990-3997.

Korn, D. and J. J. Lambiotte, Jr.: *Computing the fast Fourier transform on a vector computer*. ICASE Report No. 78-5, February 23, 1978, 29 pages. Math. Comp., Vol. 33, No. 147, July 1979, pp. 977-992.

Abarbanel, S. and D. Gottlieb: *Stability of two-dimensional initial boundary value problems using leap frog type schemes*. ICASE Report No. 78-6, February 28, 1978, 22 pages. Math. Comp., Vol. 33, No. 148, October 1979, pp. 1145-1155.

Fix, G. J., M. D. Gunzburger, and R. A. Nicolaides: *On mixed finite element methods: III. The grid decomposition property and examples.* ICASE Report No. 78-7, March 9, 1978, 30 pages. Revised under the title *On mixed finite element methods for first order elliptic systems*, ICASE Report No. 81-3, January 15, 1981, 35 pages. Num. Math., Vol. 37, 1981, pp. 29-48.

Nicolaides, R. A.: *On finite element multi-grid algorithms and their use.* ICASE Report No. 78-8, March 17, 1978, 17 pages. Proc. of the Conference on the Mathematics of Finite Elements and Applications, Brunel University, England, April 1978.

Jordan, H.: *A special purpose architecture for finite element analysis.* ICASE Report No. 78-9, March 29, 1978, 30 pages. Proc. of the 1978 Intl. Conference on Parallel Processing, August 22-25, 1978, G. Jack Lipovski (ed.), IEEE Computer Society Press, pp. 263-266.

Schwartz, J. T.: *Instantiation and decision procedures for certain classes of quantified set-theoretic formulae.* ICASE Report No. 78-10, August 11, 1978, 20 pages.

Wenzel, A. R.: *Frequency spectra of solutions of stochastic equations with applications to spectral broadening of waves propagating in a random medium.* ICASE Report No. 78-11, August 14, 1978. A revision of this paper appears as ICASE Report No. 79-21, J. Math. Phys., August 1980, p. 2131.

Rose, M. E.: *Operator factorizations generalizing the Gauss elimination method.* ICASE Report No. 78-12, August 22, 1978, 10 pages.

Gottlieb, D., M. D. Gunzburger, and E. Turkel: *Numerical boundary treatment for systems of hyperbolic equations.* ICASE Report No. 78-13, September 7, 1978, 23 pages. SIAM J. Numer. Anal., Vol. 19, No. 4, 1982, pp. 671-697.

Fung, T., C. Liu, and M. D. Gunzburger: *Simulation of the pressure field near a jet by randomly distributed vortex rings.* ICASE Report No. 78-14, September 8, 1978, 20 pages. AIAA J., Vol. 17, 1979, pp. 553-557.

Fix, G. J. and M. D. Gunzburger: *On numerical methods for acoustic problems.* ICASE Report No. 78-15, September 13, 1978, 34 pages. Math. Comput. with Appl., Vol. 6, 1980, pp. 265-278.

Strikwerda, J. C.: *Initial boundary value problems for the method of lines.* ICASE Report No. 78-16, September 27, 1978, 22 pages. J. Comput. Phys., Vol. 34, 1980, pp. 94-107.

Strikwerda, J. C.: *Time-singular systems of partial differential equations.* ICASE Report No. 78-17, September 30, 1978, 36 pages.

Brandt, A.: *Multi-level adaptive techniques (MLAT) for singular perturbation problems.* ICASE Report No. 78-18, October 12, 1978, 90 pages. Numerical Analysis of Singular Perturbation Problems, P. W. Hemker and J. J. H. Miller (eds.), Academic Press, 1979, pp. 53-142.

Turkel, E.: *On the practical use of high order methods for hyperbolic systems.* ICASE Report No. 78-19, November 16, 1978, 39 pages. J. Comput. Phys., Vol. 35, 1980, pp. 319-340.

Madsen, N.: *Cylic odd-even reduction for symmetric circulant matrices.* ICASE Report No. 78-20, November 14, 1978, 26 pages. J. Linear Algebra and Applications, Vol. 51, 1983, pp. 17-35.

McRae, D. and M. Y. Hussaini: *Numerical simulation of supersonic cone flow at high angle of attack.* ICASE Report No. 78-21, November 15, 1978, 10 pages. Proc. of the AGARD FDP Symposium on High Angle of Attack Aerodynamics, Sandefjord, Norway, October 4-6, 1978, (AGARD-CPP 247), pp. 23-1 to 23-10.

Bayliss, A. and E. Turkel: *Computation of acoustic waves in a jet* ICASE Report No. 78-22, December 22, 1978, 32 pages.

ICASE Reports: 1977

Hamlin, G. H., Jr. and C. William Gear: *Raster-scan hidden surface algorithm techniques.* ICASE Report No. 77-1, January 7, 1977, 27 pages. Proc. of SIGGRAPH '77, Computer Graphics, Vol. 11, No. 1977, pp. 206-213.

Harten, A.: *The artificial compression method for computation of shocks and contact discontinuities: I. Single conservation laws.* ICASE Report No. 77-2, February 16, 1977, 39 pages. Comm. Pure Appl. Math., Vol. 30, 1977, pp. 611-638.

Gottlieb, D. and E. Turkel: *On acceleration of MacCormack's scheme.* ICASE Report No. 77-3, March 1, 1977, 7 pages. J. Comput. Phys., Vol. 26, No. 2, February 1978, pp. 252-256.

Bayliss, A.: *A double shooting scheme for certain unstable and singular boundary value problems.* ICASE Report No. 77-4, March 22, 1977, 16 pages. Math. Comp., Vol. 32, No. 141, January 1978, pp. 61-71.

Bayliss, A.: *Forced oscillations in quadratically damped systems.* ICASE Report No. 77-5, March 28, 1977, 28 pages. Comm. Pure Appl. Math., Vol. 31, 1978, pp. 69-88.

Mansfield, L.: *Finite element methods for problems in dynamic elasticity.* ICASE Report No. 77-6, March 29, 1977, 19 pages.

Ortega, J. M. and R. G. Voigt: *Solution of partial differential equations on vector computers.* ICASE Report No. 77-7, March 30, 1977, 50 pages. Proc. of the 1977 Numerical Analysis and Computers Conference, ARO Report No. 77-3.

Voigt, R. G.: *The influence of vector computer architecture on numerical algorithms.* ICASE Report No. 77-8, March 21, 1977, 17 pages. High Speed Computer and Algorithm Organization, D. Kuck, D. Lawrie, and A. Sameh (eds.), Academic Press, pp. 229-244.

Hamlin, G. H., Jr. and T. Boardman: *Raster-scan conversion using concurrent microprocessors.* ICASE Report No. 77-9, May 10, 1977, 17 pages. Proc. of the First Rocky Mountain Symposium on Microprocessors, Fort Collins, Colorado, August 1977.

Hamlin, G. H., Jr. and T. Boardman: *A microprocessor based display controller.* ICASE Report No. 77-10, May 23, 1)77, 9 pages. Proc. of the Intl. Conference on Microcomputers, Minicomputers, and Microprocessors, Geneva, Switzerland, May 1977.

Gottlieb, D. and S. A. Orszag: *Theory of spectral methods for mixed initial-boundary value problems, Part II.* ICASE Report No. 77-11, July 21, 1977, 181 pages. Part II of a monograph published by SIAM-CBMS, No. 26.

Nicolaides, R. A.: *On multi-grid convergence in the indefinite case.* ICASE Report No. 77-12, July 27, 1977, 7 pages. Math. Comp., Vol. 32, No. 144, 1978, pp. 1082-1086.

Zang, T. A. and D. Haidvogel: *The accurate solution of Poisson's equation by expansion via Chebyshev polynomials.* ICASE Report No. 77-13, July 28, 1977, 31 pages. J. Comput. Phys., Vol. 30, No. 2, 1979, pp. 167-180.

Gunzburger, M. D. and R. Plemmons: *Energy conserving norms for the solution of hyperbolic systems of partial differential equations.* ICASE Report No. 77-14, July 29, 1977, 15 pages. Math. Comp., Vol. 33, 1979, pp. 1-10.

Bayliss, A.: *On the use of coordinate stretching in the numerical computation of high frequency scattering.* ICASE Report No. 77-15, November 14, 1977, 21 pages. J. Sound Vib., Vol. 60, No. 4, 1978, pp. 543-553.

Fix, G. J. and S. Marin: *Variational methods for underwater acoustic problems.* ICASE Report No. 77-16, August 26, 1977, 44 pages. J. Comput. Phys., Vol. 28, No. 2, August 1978, pp. 253-270.

Fix, G. J., M. D. Gunzburger, and R. A. Nicolaides: *On mixed finite element methods: I. The Kelvin principle.* ICASE Report No. 77-17, December 28, 1977, 18 pages. Revised under the title *On mixed finite element methods for first order elliptic systems,* ICASE Report No. 81-3, January 15, 1981, 35 pages. Numer. Math., Vol. 37, 1981, pp. 29-48.

Fix, G. J., M. D. Gunzburger, and R. A. Nicolaides: *On finite element methods of the least squares type.* ICASE Report No. 77-18, December 30, 1977, 15 pages. Comput. Math. Appl., Vol. 5, 1979, pp. 87-98.

Nicolaides, R. A.: *On some theoretical and practical aspects of multigrid methods.* ICASE Report No. 77-19, October 20, 1977, 34 pages. Math. Comp., Vol. 33, No. 147, July 1979, pp. 933-952.

Brandt, A.: *Multi-level adaptive techniques (MLAT) for partial differential equations: Ideas and software.* ICASE Report No. 77-20, November 20, 1977, 42 pages. Mathematical Software III, J. Rice (ed.), Academic Press, 1977, pp. 273-314.

Mansfield, L.: *Finite element methods for nonlinear shell analysis.* ICASE Report No. 77-21, December 9, 1977, 17 pages. Numer. Math., Vol. 37, 1981, pp. 121-131.

Salas, M. D. and J. Daywitt: *Structure of the conical flowfield about external axial corners.* ICASE Report No. 77-22, November 16, 1977, 9 pages. Presented at the AIAA 16th Aerospace Sciences Meeting, Huntsville, Alabama, January 16 18, 1978.

ICASE Reports: 1976

Hamlin, G. H., Jr.: *Configurable applications for satellite graphics.* ICASE Report No. 76-1, January 2, 1976, 20 pages. Proc of the Third Annual Conference on Computer Graphics Interactive Techniques and Images Processing, Vol. 10, No. 2, July 1976, pp. 196-203.

Sherman, S. and R. Brice: *I/O buffer performance in a virtual memory system.* ICASE Report No. 76-2, February 2, 1976, 24 pages. Proc. of the Fourth Symposium on the Simulation of Computer Systems, Vol. 4, August 1976, pp. 25-35.

Gunzburger, M. D.: *On the stability of Galerkin methods for initial-boundary value problems for hyperbolic systems.* ICASE Report No. 76-3, February 20, 1976, 25 pages. Math. Comp., Vol. 31, No. 139, July 1977, pp. 661-675.

Wenzel, A. R.: *A note on wave propagation over an impedance boundary.* ICASE Report No. 76-4, February 20, 1976, 6 pages. Accepted by the Journal of the Acoustical Society of America but withdrawn.

Raffenetti, R. C. and M. D. Gunzburger: *A note on the application of the finite-difference boundary value method to the calculation of Born-Oppenheimer vibrational eigenvalues for the double minimum E, F^1, Σ_g^+ state of the hydrogen molecule.* ICASE Report No. 76-5, February 25, 1976, 5 pages.

Sherman, S. and R. Brice: *Performance of a database management system with partially locked virtual buffers.* ICASE Report No. 76-6, February 27, 1976, 15 pages. Appeared under the title *An extension of the performance of a database manager in a virtual memory system using partially locked virtual buffers* in ACM Trans. on Database Systems, Vol. 2, No. 2, June 1977.

Gear, C. William: *The stability of numerical methods for second order ordinary differential equations.* ICASE Report No. 76-7, March 16, 1976, 14 pages. SIAM J. Numer. Anal., Vol. 15, No. 1, February 1978, pp. 188-197.

South, J. C., Jr. and A. Brandt: *Application of a multi-level grid method to transonic flow calculations.* ICASE Report No. 76-8, March 19, 1976, 29 pages. Transonic Flow Problems in Turbomachinery, T. C. Adams and M. F. Platzer (eds.), Hemisphere Publishing Company, Washington, 1977, pp. 180-207.

Brice, R. and S. Sherman: *Empirical comparison of partitioned and non-partitioned buffer management in virtual memory system.* ICASE Report No. 76-9, March 25, 1976, 14 pages.

EUROCAMP Conference Proceedings, Computer Performance Evaluation, Online, Middlesex, England, September 1976, pp. 1-16.

Fix, G. J. and M. D. Gunzburger: *Downstream boundary conditions for viscous flow problems.* ICASE Report No. 76-10, April 7, 1976, 27 pages. Comput. Math. Appl., Vol. 3, 1977, pp. 53-63.

Kleinstein, G. and M. D. Gunzburger: *Frequency modulation at a moving material interface and a conservation law for wave number.* ICASE Report No. 76-11, April 20, 1976, 24 pages. J. Sound Vib., Vol. 48, No. 2, 1976, pp. 169-178.

Gottlieb, D. and M. D. Gunzburger: *On the matrix equations $AH + HA^* = A^*H + HA = I$.* ICASE Report No. 76-12, April 21, 1976, 6 pages. J. Linear Algebra and Applications, Vol. 17, 1977, pp. 277-282.

Mastin, C. W. and J. F. Thompson: *Transformation of three-dimensional regions onto rectangular regions by elliptic systems.* ICASE Report No. 76-13, April 26, 1976, 21 pages. Numer. Math., Vol. 29, 1978, pp. 397-407.

Mastin, C. W. and J. F. Thompson: *Elliptic systems and numerical transformations.* ICASE Report No. 76-14, May 25, 1976, 19 pages. J. Math. Anal. Appl., Vol. 62, No. 1, January 1978, pp. 52-62.

Gunzburger, M. D. and G. Kleinstein: *On the mathematical conditions for the existence of periodic fluctuations in nonuniform media.* ICASE Report No. 76-15, May 26, 1976, 28 pages. J. Sound Vib., Vol. 48, No. 3, October 1976, pp. 345-357.

George, J. Alan, W. G. Poole, Jr., and R. G. Voigt: *A variant of nested dissection for solving n by n grid problems.* ICASE Report No. 76-16, June 1, 1976, 22 pages. SIAM J. Numer. Anal., Vol. 15, No. 4, August 1978, pp. 662-673.

George, J. Alan, W. G. Poole, Jr., and R. G. Voigt: *Analysis of dissection algorithms for vector computers.* ICASE Report No. 76-17, June 8, 1976, 58 pages. Comput. Math. Appl., Vol. 4, 1978, pp. 287-304.

Kleinstein, G. and M. D. Gunzburger: *Applications of the wave number jump condition to the normal and oblique interaction of a plane acoustic wave and a plane shock.* ICASE Report No. 76-18, July 1, 1976, 23 pages. J. Sound Vib., Vol. 53, No. 3, 1977, pp. 417-433.

Turkel, E.: *Extrapolation methods for dynamic partial differential equations.* ICASE Report No. 76-19, July 6, 1976, 27 pages. Numer. Math., Vol. 29, No. 3, 1978, pp. 269-285.

Raffenetti, R. C., K. Hsu, and I. Shavitt: *Selection of terms for a CI wavefunction to preserve potential surface features.* ICASE Report No. 76-20, July 8, 1976, 21 pages. Theoretica Chimica Acta, Vol. 45, 1977, pp. 33-44.

Wenzel, A. R.: *Propagation of sound in turbulent media.* ICASE Report No. 76-21, July 15, 1976, 9 pages. Advances in Engineering Sciences, NASA CP-2001, Vol. 3, NASA, Hampton, Virginia, pp. 987-996.

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Cline, A.: *Several observations on the use of conjugate gradient methods.* ICASE Report No. 76-22, August 10, 1976, 30 pages.

Boardman, T.: *A microprocessor architecture for digital device implementation.* ICASE Report No. 76-23, August 12, 1976, 16 pages. Proc. of the AFIPS 1977 National Computer Conference, Dallas, Texas, June 1977, pp. 201-205.

Mansfield, L.: *Mixed finite element methods for elliptic equations.* ICASE Report No. 76-24, August 18, 1976, 11 pages. Comput. Math. Appl., Vol. 7, 1981, pp. 59-66.

Fix, G. J.: *A mixed finite element scheme for transonic flows.* ICASE Report No. 76-25, August 26, 1976, 39 pages. Numer. Math., Vol. 28, 1977, pp. 259-271.

Fix, G. J. and M. D. Gunzburger: *On least squares approximations to indefinite problems of the mixed type.* ICASE Report No. 76-26, August 30, 1976, 39 pages. Intl. J. Numer. Methods Engrg., Vol. 12, 1978, pp. 453-469.

Brandt, A.: *Multi-level adaptive solutions to boundary value problems.* ICASE Report No. 76-27, August 30, 1976, 102 pages. Math. Comp., Vol. 31, No. 138, April 1977, pp. 333-390.

Trivedi, K.: *Prepaging and applications to the STAR-100 computer.* ICASE Report No. 76-28, August 30, 1976, 20 pages. High Speed Computer and Algorithm Organizations, D. Kuck, D. Lawrie, and A. Sameh (eds.), Academic Press, pp. 435-446.

Wenzel, A. R.: *A note on the forward-scatter approximation.* ICASE Report No. 76-29, October 4, 1976, 4 pages. J. Acous. Soc. of Amer., Vol. 61, No. 3, March 1977, pp. 882-883.

Gottlieb, D. and E. Turkel: *Boundary conditions for multi-step finite difference methods for time dependent equations.* ICASE Report No. 76-30, September 13, 1976, 25 pages. J. Comput. Phys., Vol. 26, No. 2, February 1978, pp. 181-196.

Bucy, R., K. Senne, and H. Youssef: *Pipeline parallel and serial realization of phase demodulators.* ICASE Report No. 76-31, November 22, 1976, 67 pages. Proc. of Conference on Stochastic Control, 1976.

Gottlieb, D. and S. A. Orszag: *Numerical analysis of spectral methods for mixed initial boundary value problems.* ICASE Report No. 76-32, November 26, 1976, 89 pages. Part I of a monograph published by SIAM-CBMS, No. 26.

ICASE Reports: 1975

Fix, G. J.: *Finite elements and fluid dynamics.* ICASE Report No. 75-1, February 1, 1975, 48 pages. Proc. of the First Intl. Symposium on Computational Methods in Nonlinear Mechanics, Springer-Verlag Lecture Notes, T. Oden (ed.), Vol. 461, 1975, pp. 47-70.

Gunzburger, M. D., C. Liu, and L. Maestrello: *Simulation by vortex rings of the unsteady pressure field near a jet.* ICASE Report No. 75-2, February 12, 1975, 7 pages. Progress in Astronautics and Aeronautics, I. Schwartz (ed.), MIT Press, Vol. 33, 1976, pp. 47-64.

Basili, V. and J. C. Knight: *A language design for vector machines.* ICASE Report No. 75-3, February 18, 1975, 14 pages. Proc. of the Conference on Programming Language and Compilers for Parallel and Vector Machines, SIGPLAN Notices, Vol. 10, No. 3, March 1975, pp. 39-43.

Raffenetti, R. C.: *Optimal even-tempered Gaussian atomic orbital bases: First row atoms.* ICASE Report No. 75-4, February 25, 1975, 12 pages. Proc. of the Intl. Journal of Quantum Chemistry, Symposium No. 9, 1975, pp. 289-295.

Gottlieb, D. and B. Gustaffson: *Generalized DuFort-Frankel methods for parabolic initial-boundary value problems.* ICASE Report No. 75-5, February 27, 1975, 32 pages. SIAM J. Numer. Anal., Vol. 13, No. 1, March 1976, pp. 129-144.

Knight, J. C., W. C. Poole, Jr. and R. G. Voigt: *System balance analysis for vector computers.* ICASE Report No. 75-6, March 21, 1975, 25 pages. Proc. of the ACM National Conference, October 1975, pp. 163-168.

Hardgrave, W. T.: *Set processing in a network environment.* ICASE Report No. 75-7, March 31, 1975, 43 pages. Appeared under the title *Set Processing: A tool for data management,* in Proc. of the ACM/NBS 15th Annual Technology Symposium, June 1976.

Hardgrave, W. T.: *Accessing technical data bases using STDS: A collection of scenarios.* ICASE Report No. 75-8, April 16, 1975, 84 pages.

Crane, H., Jr., N. Gibbs, W. G. Poole, Jr., and P. Stockmeyer: *Matrix bandwidth and profile reduction.* ICASE Report No. 75-9, April 14, 1975, 19 pages. ACM Trans. Math. Software, Vol. 2, No. 4, December 1976, pp. 375-377.

Hirsh, R., B. Pitts, and M. Wolfshtein: *Second order non-iterative ADI solution of nonlinear partial differential equations.* ICASE Report No. 75-10, May 12, 1975, 7 pages. Advances in Computer Methods for Partial Differential Equations, R. Vichnevetsky (ed.), published by AICA, 1975, pp. 26-32.

Atias, M., M. Wolfshtein, and M. Israeli: *Efficiency of Navier-Stokes solvers.* ICASE Report No. 75-11, May 12, 1975, 10 pages. AIAA J., Vol. 15, No. 2, February 1977, pp. 8263-8266.

Gottlieb, D. and B. Gustaffson: *On the Navier-Stokes equations with constant total temperature.* ICASE Report No. 75-12, June 2, 1975, 33 pages. Stud. Appl. Math., Vol. 55, 1976, pp. 167-185.

Stone, H.: *Sorting on STAR.* ICASE Report No. 75-13, June 5, 1975, 32 pages. Trans. Software Engrg., Vol. 4, No. 2, March 1978, pp. 138-146.

Cline, A.: *The transformation of a quadratic programming problem into solvable form.* ICASE Report No. 75-14, August 11, 1975, 14 pages.

Gerhart, S.: *On the relationship between structured programming and correctness proofs.* ICASE Report No. 75-15, August 13, 1975, 26 pages. Infotech State of the Art Report; Structured Programming, 1976, pp. 229-242.

Ghil, M.: *Initialization by compatible balancing.* ICASE Report No. 75-16, August 22, 1975.

Boisvert, R. and W. G. Poole, Jr.: *An interactive graphics package for the automatic node renumbering of finite element matrices.* ICASE Report No. 75-17, September 24, 1975, 10 pages. Proc. of the Applications of Computer Graphics in Engineering Conference, October 1975, pp. 605-614.

Abarbanel, S.: *The slow recirculating flow near the rear stagnation point of a wake.* ICASE Report No. 75-18, September 29, 1975, 13 pages.

Turkel, E.: *Composite methods for hyperbolic equations.* ICASE Report No. 75-19, September 29, 1975, 33 pages. SIAM J. Numer. Anal., Vol. 14, No. 4, September 1977, pp. 744-759.

Sherman, S. and R. Brice: *Experiments concerning buffer management in a virtual memory system.* ICASE Report No. 75-20, October 6, 1975, 36 pages. Appeared under the title *Performance of a database manager in a virtual memory system,* in ACM Trans. Database Systems, Vol. 1, No. 4, December 1976, pp. 317-343.

Abarbanel, S. and D. Gottlieb: *A note on the leap-frog scheme in two- and three-dimensions.* ICASE Report No. 75-21, October 30, 1975, 6 pages. J. Comput. Phys., Vol. 21, No. 3, 1976, pp. 351-355.

Gottlieb, D. and E. Turkel: *Dissipative two-four methods for time dependent problems.* ICASE Report No. 75-22, October 30, 1975, 40 pages. Math. Comp., Vol. 30, No. 136, October 1976, pp. 703-723.

Earlier ICASE Reports

Fix, G. J.: *Finite element approximation of ocean circulation problems.* SIAM J. Appl. Math., Vol. 29, No. 3, November 1975, pp. 371-387.

Gunzburger, M. D., C. Liu, L. Maestrello, and L. Ting: *Sound propagation through a real jet flow field with scattering due to interaction with turbulence.* J. Engrg. Math., Vol. 10, No. 6, July 1976, pp. 47-64.

Lambiotte, J. J., Jr. and R. G. Voigt: *The solution of tridiagonal linear systems on the CDC STAR-100 computer.* ACM Trans. Math. Software, Vol. 1, No. 4, December 1975, pp. 308-329.

Gibbs, N., W. G. Poole, Jr., and P. Stockmeyer: *An algorithm for reducing the bandwidth and profile of a sparse matrix.* SIAM J. Numer. Anal., Vol. 13, No. 2, April 1976, pp. 236-250.

George, J. Alan: *A negative result on sparse matrix splitting in the context of Gaussian elimination.* SIAM J. Numer. Anal., Vol. 13, No. 6, December 1976, pp. 846-853.

Rosenbaum, J.: *Conservation properties of numerical integration methods for systems of ordinary differential equations.* J. Comput. Phys., Vol. 20, No. 3, March 1976, pp. 259-267.

Poole, W. G., Jr. and R. G. Voigt: *Numerical algorithms for parallel and vector computers: An annotated bibliography.* Comput. Rev., Vol. 15, No. 10, October 1974, pp. 379-388.

Heller, D.: *Some aspects of the cylic reduction algorithm for block tridiagonal linear systems.* SIAM J. Numer. Anal., Vol. 13, No. 4, September 1976, pp. 484-496.

Cline, A.: *A descent method for the uniform solution of overdetermined systems of linear equations.* SIAM J. Numer. Anal., Vol. 13, No. 3, June 1976, pp. 293-309.

Swint, E. and D. Yen: *Periodic solutions in a class of nonlinear dual-mass systems.* Computational Methods in Nonlinear Mechanics, University of Texas, Austin, Texas.

Sherman, S., J. Howard, Jr., and J. C. Browne: *Trace driven studies of deadlock control and job scheduling.* Springer-Verlag Notes in Computer Science, Vol. 26, 1975, pp. 386-395.

Hardgrave, W. T.: *Positioned versus keyword parameter communication.* SIGPLAN Notices, Vol. 11, No. 5, May 1976.

Poole, W. G., Jr., N. Gibbs, and P. Stockmeyer: *A comparison of several bandwidth and profile reduction algorithms.* ACM Trans. Math. Software, Vol. 2, No. 4, December 1976, pp. 322-330.

Other Reports by ICASE Personnel

Bokhari, S., M. Y. Hussaini, and S. Orszag: *Fast orthogonal derivatives on the STAR.* Comput. Math. Appl., Vol. 8, No. 5, 1982, pp. 367-377.

Salas, M. D. and C. R. Gumbert: *Non-unique solutions to the transonic potential flow equation.* AIAA Technical Note (NASA).

Bayliss, A., L. Maestrello, and E. Turkel: *Simulation of the fluctuating field of a forced jet.* Lecture Notes in Physics, No. 170, E. Krause (ed.), Springer-Verlag, 1982, pp. 131-137.

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Report Documentation Page

1. Report No. NASA CR-187506	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle CUMULATIVE REPORTS AND PUBLICATIONS through December 31, 1990		**5. Report Date** February 1991
		6. Performing Organization Code
7. Author(s)		**8. Performing Organization Report No.**
		10. Work Unit No. 505-90-52-01
9. Performing Organization Name and Address Institute for Computer Applications in Science and Engineering Mail Stop 132C, NASA Langley Research Center Hampton, VA 23665-5225		**11. Contract or Grant No.** NAS1-18605, NAS1-18107, NAS1-17070, etc.
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Langley Research Center Hampton, VA 23665-5225		**13. Type of Report and Period Covered** Contractor Report
		14. Sponsoring Agency Code

15. Supplementary Notes

Langley Technical Monitor:
Michael F. Card

Final Report

16. Abstract

   This document contains a complete list of ICASE reports. Since ICASE reports are intended to be preprints of articles that will appear in journals or conference proceedings, the published reference is included when it is available.

17. Key Words (Suggested by Author(s))	18. Distribution Statement		
Mathematics, Numerical Analysis, Computer Science	59 - Mathematical and Computer Sciences (General) Unclassified - Unlimited		
19. Security Classif. (of this report) Unclassified	**20. Security Classif. (of this page)** Unclassified	**21. No. of pages** 76	**22. Price** A05

NASA FORM 1626 OCT 86